IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	Beckmann et al.
Serial Number:	10/523,065
Date Filed:	July 15, 2003
Group Art Unit:	2617
Confirmation No.:	7574
Examiner:	Zewari, Sayed T.
Title:	**METHOD, SUBSCRIBER DEVICE AND RADIO COMMUNICATION SYSTEM FOR TRANSMITTING USER DATA MESSAGES**
Publication No.:	2006/0094441A1
Publication Date:	May 4, 2006

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir or Madam:

REQUEST FOR REPUBLICATION OF PATENT APPLICATION PUBLICATION

Applicants respectfully request the Related U.S. Application Data info for the above-referenced patent application be corrected for publication purposes. Applicants believe the Related U.S. Application Data was incorrectly published for the above-referenced patent application.

Please correct the Related U.S. Application Data on the face page by inserting the following after, "Assignee" from: "THE JO0HNS HOPKINS UNIVERSITY, BALTIMORE, MD" to -- **SIEMENS AKTIENGESELLSCHAFT, Wittelsbacherplatz 2, Munich, Germany** --, as evidenced on the attached copy of the Application Data Sheet 37 CFR 1.76 and the Patent Application as submitted.

Applicants believe this is not an error by the Applicants. If there are any matters concerning this application that may be cleared up in a telephone conversation, please contact Applicants' attorney at 512.457.2030.

Respectfully submitted,

KING & SPALDING L.L.P.
Attorneys for Applicants

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Enclosures: 1) Copy of the Application Data Sheet 37 CFR 1.76
2) Copy of the Patent Application

PTO/SB/14 (11-08)
Approved for use through 09/30/2010. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	03869.105734
	Application Number	10/523,065
Title of Invention	Method, Subscriber Device and Radio Communication System for Transmitting User Data Messages	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Applicant Information:

Applicant 1

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PTO/SB/14 (11-08)
Approved for use through 09/30/2010. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	03869.105734
	Application Number	10/523,065
Title of Invention	Method, Subscriber Device and Radio Communication System for Transmitting User Data Messages	

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Applicant Authority (•) Inventor ( ) Legal Representative under 35 U.S.C. 117 ( ) Party of Interest under 35 U.S.C. 118

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All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. [Add]

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	86528		
Email Address		[Add Email]	[Remove Email]

Application Information:

Title of the Invention	Method, Subscriber Device and Radio Communication System for Transmitting User Data Messages		
Attorney Docket Number	03869.105734	**Small Entity Status Claimed**	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Suggested Class (if any)	455	**Sub Class (if any)**	455
Suggested Technology Center (if any)	2617		
Total Number of Drawing Sheets (if any)	3	**Suggested Figure for Publication (if any)**	1

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	03869.105734
	Application Number	10/523,065
Title of Invention	Method, Subscriber Device and Radio Communication System for Transmitting User Data Messages	

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)
☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S. C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Enter either Customer Number or complete the Representative Name section below. If both sections are completed the Customer Number will be used for the Representative Information during processing.

Please Select One:	◉ Customer Number	○ US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	86528		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78(a)(2) or CFR 1.78(a)(4), and need not otherwise be made part of the specification.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
PCT/DE2003/002381	a 371 of international		2003-07-15

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button.

Foreign Priority Information:

This section allows for the applicant to claim benefit of foreign priority and to identify any prior foreign application for which priority is not claimed. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(a).

			Remove
Application Number	Country[1]	Parent Filing Date (YYYY-MM-DD)	Priority Claimed
10-235-470.7	DE	2002-08-02	◉ Yes ○ No

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button.

Assignee Information:

Providing this information in the application data sheet does not substitute for compliance with any requirement of part 3 of Title 37 of the CFR to have an assignment recorded in the Office.

Assignee 1

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	03869.105734
	Application Number	10/523,065
Title of Invention	Method, Subscriber Device and Radio Communication System for Transmitting User Data Messages	

If the Assignee is an Organization check here. ☒			
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Signature:

A signature of the applicant or representative is required in accordance with 37 CFR 1.33 and 10.18. Please see 37 CFR 1.4(d) for the form of the signature.					
Signature	Eric Grabski			Date (YYYY-MM-DD)	2010-08-30
First Name	Eric	Last Name	Grabski	Registration Number	51,749

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

2002P11739WOUS

Declaration and Power of Attorney For Patent Application
Erklärung Für Patentanmeldungen Mit Vollmacht
German Language Declaration

Als nachstehend benannter Erfinder erkläre ich hiermit an Eides Statt:

dass mein Wohnsitz, meine Postanschrift, und meine Staatsangehörigkeit den im Nachstehenden nach meinem Namen aufgeführten Angaben entsprechen, dass ich, nach bestem Wissen der ursprüngliche, erste und alleinige Erfinder (falls nachstehend nur ein Name angegeben ist) oder ein ursprünglicher, erster und Miterfinder (falls nachstehend mehrere Namen aufgeführt sind) des Gegenstandes bin, für den dieser Antrag gestellt wird und für den ein Patent für die Erfindung mit dem Titel beantragt wird:

Verfahren, Teilnehmergerät sowie Funkkommunikationssystem zum Übertragen von Nutzdatennachrichten

deren Beschreibung hier beigefügt ist, es sei denn (in diesem Falle Zutreffendes bitte ankreuzen), diese Erfindung

☒ wurde angemeldet am 15.07.2003 unter der US-Anmeldenummer oder unter der Internationalen Anmeldenummer im Rahmen des PCT-Vertrags PCT/DE03/02381 und am 20.08.2004 abgeändert (falls zutreffend).

Ich bestätige hiermit, dass ich den Inhalt der obigen Patentanmeldung einschliesslich der Ansprüche, die eventuell durch einen Zusatzantrag wie oben erwähnt abgeändert wurde, durchgesehen und verstanden habe.

Ich erkenne meine Pflicht zur Offenbarung jeglicher Informationen an, die zur Prüfung der Patentfähigkeit in Einklang mit Titel 37, Code of Federal Regulations, § 1.56 von Belang sind.

Ich beanspruche hiermit ausländische Prioritätsvorteile gemäß Title 35, United States Code, § US-Code, § 119 (a)-(d), bzw. § 365(b) aller unten aufgeführten Auslandsanmeldungen für Patente oder Erfinderurkunden, oder § 365(a) aller PCT internationalen Anmeldungen, welche wenigstens ein Land ausser den Vereinigten Staaten von Amerika benennen, und habe nachstehend durch ankreuzen sämtliche Auslandsanmeldungen für Patente bzw. Erfinderurkunden oder PCT Internationale Anmeldungen angegeben, deren Anmeldetag dem der Anmeldung, für welche Priorität beansprucht wird, vorangeht.

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

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the specification of which is attached hereto unless the following box is checked:

☒ was filed on 15.07.2003 as United States Application Number or PCT International Application Number PCT/DE03/02381 and was amended on August 20th, 2004 (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56.

I hereby claim foreign priority under Title 35, 119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate, or § 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed.

IDNR: 2590 / V: 04-1.03 / B: Val

German Language Declaration

Prior foreign applications
Priorität beansprucht

			Priority Claimed
10235470.7 (Number) (Nummer)	DE (Country) (Land)	02.08.2002 (Day Month Year Filed) (Tag Monat Jahr eingereicht)	☒ Yes Ja ☐ No Nein
(Number) (Nummer)	(Country) (Land)	(Day Month Year Filed) (Tag Monat Jahr eingereicht)	☐ Yes Ja ☐ No Nein
(Number) (Nummer)	(Country) (Land)	(Day Month Year Filed) (Tag Monat Jahr eingereicht)	☐ Yes Ja ☐ No Nein
(Number) (Nummer)	(Country) (Land)	(Day Month Year Filed) (Tag Monat Jahr eingereicht)	☐ Yes Ja ☐ No Nein

Ich beanspruche hiermit die mir unter Title 35, US-Code, § 120 zustehenden Vorteile aller unten aufgeführten US-Patentanmeldungen bzw. § 365(c) aller PCT internationalen Anmeldungen, welche die Vereinigten Staaten von Amerika benennen, und erkenne, insofern der Gegenstand eines jeden früheren Anspruchs dieser Patentanmeldung nicht in einer US-Patentanmeldung, bzw. PCT internationalen Anmeldung in einer gemäß dem ersten Absatz von Title 35, US-Code, § 112 vorgeschriebenen Art und Weise offenbart wurde, meine Pflicht zur Offenbarung jeglicher Informationen an, die zur Prüfung der Patentfähigkeit in Einklang mit Title 37, Code of Federal Regulations, § 1.56 von Belang sind und die im Zeitraum zwischen dem Anmeldetag der früheren Patentanmeldung und dem nationalen oder im Rahmen des Vertrags über die Zusammenarbeit auf dem Gebiet des Patentwesen (PCT) gültigen internationalen Anmeldetags bekannt geworden sind.

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s), or § 365(c) of any PCT international application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT international application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

(Application Serial No.) (Anmeldeseriennummer)	(Filing Date D, M, Y) (Anmeldedatum T, M, J)	(Status) (patentiert, anhängig, aufgegeben)	(Status) (patented, pending, abandoned)
PCT/DE03/02381	15.07.2003	anhängig	pending

Ich erkläre hiermit, daß alle in der vorliegenden Erklärung von mir gemachten Angaben nach bestem Wissen und Gewissen der Wahrheit entsprechen, und ferner daß ich diese eidesstattliche Erklärung in Kenntnis dessen ablege, daß wissentlich und vorsätzlich falsche Angaben oder dergleichen gemäß § 1001, Title 18 des US-Code strafbar sind und mit Geldstrafe und/oder Gefängnis bestraft werden können und daß derartige wissentlich und vorsätzlich falsche Angaben die Rechtswirksamkeit der vorliegenden Patentanmeldung oder eines aufgrund deren erteilten Patentes gefährden können.

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German Language Declaration

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POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith: *(list name and registration number)*

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And I hereby appoint

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Form PTO/SB/103 (8-86) Patent and Trademark Office-U.S. Department of COMMERCE

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Staatsangehörigkeit	Citizenship
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Wohnsitz	Residence
Staatsangehörigkeit	Citizenship
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(Supply similar information and signature for third and subsequent joint inventors).

Form PTO/SB/103 (8-98) Patent and Trademark Office-U.S. DEPARTMENT OF COMMERCE

Description

Method, subscriber device and radio communication system for transmitting user data messages

The present invention relates to a method for transmitting user data messages, from a sender to one or more recipients, a subscriber device and a radio communication system.

In the case of many services and applications which are offered in modern mobile radio systems, messages must be transmitted to not just one subscriber, but to two or more subscribers. Such services and applications include, for example, news groups, video conferences, video on demand, distributed applications, etc.

When transmitting the messages to the different subscribers, it is possible to send a copy of the data to each recipient separately. Although this technique is easy to implement, it is unsuitable for large groups. Because the same message is transmitted over N individual connections or unicast connections (N corresponds to the number of recipients) and is therefore sent multiple times over shared connection paths, this method requires a very high bandwidth.

A more advantageous possibility is offered by multicast (group call) transmission. Here, the different subscribers to whom the same message is to be transmitted are combined into a multicast group and said group is assigned an address which is specifically known as a multicast address. The data which must be transmitted is only sent once to this multicast address accordingly. In an ideal case, the multicast message is sent only once over shared connection paths from the sender to the recipients. It is not necessary for the sender to know where and how many recipients are hiding behind the multicast address.

In the case of broadcast (collective call), messages are sent to all subscribers within a geographical area. Such an area can be specified as a part of the overall network, for example. As in the

case of multicast, the broadcast message is ideally sent only once over shared connection paths from the sender to the recipients. Each subscriber must implement enabling settings at the local terminal if said subscriber wishes subsequently to analyze broadcast packets from a corresponding broadcast group. In this way, individual subscribers can specify whether they wish to receive or discard all broadcast messages, or whether they wish to receive specific messages only.

As part of a known method for data communication, a specific quantity of frames is normally always exchanged between a network and a mobile radio device within a specific time. In this case, a frame is a time-relative structure, upon which in UMTS (Universal Mobile Telecommunications System), for example, the entire signal processing and data transmission is based, see [2].

If all these frames are continuously transmitted and received by the mobile radio device, this is known as continuous transmission or continuous reception. However, it is also possible during the transmission to use an interrupted (discontinuous) reception, namely Discontinuous Reception DRX, in order to reduce the energy requirements of the mobile radio devices, for example. When using DRX, the frames are not continuously transmitted and received by the mobile radio devices, but specific frames are omitted. In this mode, however, at least a specific subset of all frames or a subset of the possible frames must be transmitted in order to maintain the connection.

In the context of transmitting messages or data to various subscribers, it is now also conceivable to provide for a transmission of messages having multimedia content. A problem can arise here, however, in that not all data types of transmitted multimedia messages can be processed by every subscriber device. In this case, it is then possible for a subscriber device to use resources and energy for receiving specific multimedia messages containing audio and video data, and for it then to transpire when processing the messages that the subscriber device is not designed

to process or playback video data at all. In such a case, energy is wasted for no purpose and the service life of the subscriber device is reduced.

The object of the present invention is therefore to create a possibility which provides an efficient, resource-saving, energy-saving transmission of data or messages to one or more recipients of a point-to-multipoint service.

This problem is solved by a method according to Claim 1, a subscriber device according to Claim 12, and a radio communication system in accordance with Claim 13. Advantageous configurations are the subject matter of the subclaims.

According to a method for transmitting user data messages from a network element of a radio communication system over at least one transmission channel to one or more subscriber devices of the radio communication system, the form of the user data messages is announced by means of a planning information before their transmission. In particular, the form in relation to the processing of the user data messages by the subscriber device or subscriber devices is announced in this context. The advantage of such a method is that the subscriber device or devices know from the announcement of the form of the user data messages, even before the user data messages are actually transmitted or actually received, whether said subscriber device or devices are capable of processing the user data messages in such a way that they are useful to the user of the subscriber device (displaying a picture which is contained in the user data messages, playing an audio file, etc.). This means that, on the basis of the planning information, the subscriber device or the plurality of subscriber devices can decide to receive only those user data messages which they are also capable of processing, thereby making it possible to save both resources and energy on the subscriber devices.

According to an advantageous configuration, the method is implemented as a two-stage method, wherein the planning information

is transmitted to the subscriber device or the plurality of subscriber devices by means of two separate planning messages. The transmission of the user data messages is announced by means of a first planning message via a first separate transmission channel. More precisely, the first planning message can contain information about when or on which second separate transmission channel, of which there is at least one, second planning messages or user data messages will be transmitted. A description information, which specifies the form of the user data messages which are to be transmitted, is then transmitted via the announced second separate transmission channel, of which there is at least one, by means of the second planning message.

According to a further advantageous configuration, the form of the user data messages which are to be transmitted can include the data type and additionally the coding of the user data messages. In this case, the data type can be a text, image, audio or video format, etc. The coding can include an MP3 (Moving Pictures Experts Group Layer-3 Audio) format, AMR (Adaptive Multi-Rate) format, WAV (Windows Wave) format, JPEG (Joint Photographic Experts Group) format or an MPEG4 (Motion Picture Experts Group 4) format. It is moreover conceivable that the description information relating to the uncoded or coded user data messages also includes parameters which refer to, for example, the data volume, the image dimensions in the case of image and/or video data, or the playback duration in the case of audio and/or video data.

According to a further advantageous configuration, the method for transmitting user data, particularly in the two-stage configuration, can be carried out in the framework of a broadcast service, in particular as an extension of a Cell Broadcast Service (CBS), or a multicast service. In this context, it is conceivable to use the method as an extension of a Cell Broadcast Service, as specified in UMTS, which would require the radio communication system to be operated in accordance with the UMTS standard.

As mentioned above, the subscriber device or subscriber devices can analyze the planning information, in particular the second planning message or the description information which is contained therein relating to the user data messages that have to be transmitted, and can therefore receive or monitor from the second transmission channel, of which there is at least one, only those user data messages which it is or they are designed to process. In this way, the processing effort and therefore the energy consumption in a subscriber device is restricted.

According to an advantageous configuration, a mobile radio device, in particular a mobile phone, is used as a subscriber device.

According to a further aspect of the invention, a subscriber device is produced for a radio communication system, said subscriber device being designed in such a way that it can be operated in accordance with one of the methods which is described above.

According to a further aspect of the invention, a radio communication system is produced for carrying out one of the methods which is described above.

Preferred embodiments of the present invention are described in greater detail below with reference to the attached drawings in which:

Figure 1 shows a schematic illustration of components of a radio communication system for notifying a group of one or more subscriber devices;

Figure 2 shows a schematic illustration of a layered model of the protocols on the radio interface between a subscriber device and the responsible base station in the radio cell of this subscriber device in the radio communication system according to Figure 1, in particular according to the UMTS standard;

Figure 3 shows an assignment of frames to a logical channel CTCH, via which the transmission of Cell Broadcast Messages takes place;

Figure 4 shows an index table, as used for a Cell Broadcast Service (CBS) in Discontinuous Reception (DRX) mode, for the purpose of allocating an index to the quantities or sets of resources or frames;

Figure 5 shows a schematic illustration of the components of a conventional BMC planning message or second planning message;

Figure 6 shows a schematic illustration of the components of a BMC planning message or second planning message, which is extended in accordance with a preferred embodiment.

Figure 1 shows an exemplary schematic illustration of two radio cells CE1, CE2 of a radio communication system FCS which is operated in particular according to the UMTS (Universal Mobile Telecommunications System) standard. In terms of radio functionality, the radio cell CE1 is covered by the base station BS1 in this case, while the second radio cell CE2 is supplied by the base station BS2. These two base stations BS1, BS2 are representative of a multiplicity of further base stations of the radio communication system FCS, which further base stations are not illustrated in Figure 1 but include and cover the corresponding radio cells. The relevant base station is preferably formed by at least one radio transmitter and at least one radio receiver. It preferably has at least one transmitter antenna. In addition to or independently of its function of providing a radio connection to subscriber devices of the radio communication system FCS, the relevant base station can be responsible for the transmission in each case of data/messages to a fixed message/data network that may be present.

Within the radio communication system FCS, message/data signals are transmitted via at least one predefined radio interface between at least one subscriber device, in particular a mobile radio device e.g. a mobile phone, and at least one base station, preferably in accordance with a Time Division Multiple Access transmission method. It is preferably developed as a mobile radio system according to the UMTS standard. In particular, it is operated in so-called FDD mode (FDD: Frequency Division Duplex). In FDD mode, a separate signal transmission is achieved in up-link and down-link directions (up-link = signal transmission from the mobile radio device to the relevant base station; down-link = signal transmission from the relevant assigned base station to the mobile radio device) by a corresponding separate assignment of frequencies or frequency ranges. A plurality of subscribers in the same radio cell are preferably separated by orthogonal codes, in particular in accordance with the so-called CDMA method (CDMA: Code Division Multiple Access).

Subscriber devices preferably take the form of mobile radio devices, e.g. mobile radio telephones and particularly mobile phones. However, components of the radio communication network can also include subscriber devices in the form of other message and/or data transmission devices e.g. internet-compatible terminals, computers, televisions, notebooks, fax devices, etc. having an assigned radio unit for communication traffic "on air", i.e. at least one radio interface. The subscriber devices are often mobile or portable in this case, i.e. are used at different locations in the radio network, but can also be permanently configured at a location if required.

In Figure 1, the two base stations BS1, BS2 are controlled or monitored by a supervisory radio network controller RNC1 via associated data lines L1, L2. Said controller monitors the assignment of radio resources in the radio cells CE1, CE2 of the base stations BS1, BS2. In the present exemplary embodiment, a multiplicity of subscriber devices UE11 to UE51 are located in the radio cell CE1 of the base station BS1. Likewise, a plurality of

subscriber devices UE12 to UE42 are currently present in the second radio cell CE2 of the base station BS2. The subscriber devices UE11, UE21, UE31 in the first radio cell CE1 and the subscriber device UE42 in the second radio cell CE2 are assigned in advance to a predefinable group MC1, for which the receipt of one or more group messages must be enabled in the most efficient way possible.

Within the framework of the invention, the term "group of subscriber devices" is preferably understood to mean a classification according to technical service, i.e. in particular a division according to those subscriber devices which allow a multicast transmission or a broadcast transmission, for example. Furthermore, the subscriber devices in the radio cells of the radio communication network can also be sorted or divided according to a multiplicity of other criteria, particularly group message type, e.g. sport messages, weather forecasts, etc., or reason for occurrence, for example.

In the case of many services and applications which are offered in modern mobile radio systems, it is particularly desirable to transmit messages to not just one but to two or more mobile radio subscribers. Examples of such services and applications are news groups, video conferences, video-on-demand, distributed applications, etc.

The protocol stack or layered model of the protocols on the radio interface in UMTS is illustrated in Figure 2, by way of example, for the subscriber device UE11 in the radio cell CE1 of the base station BS1. The mobile radio station UE11 has a physical layer PL1, which is responsible on the sending side for processing the data for transmission via the radio interface via physical channels PCS, and on the receiving side forwards the received data to the Medium Access Control layer MAC1 (MAC = Medium Access Control), which exists above it, in such a way that it can be further processed by this layer. On the network side, the physical layer PL2 is situated in the base station BS1 which is connected to the radio network controller RNC1 via a fixed network connection. The connections between the physical layer and the MAC layer are called transport

channels and specify how the data is transmitted (e.g. on general channels which are heard by every mobile radio device in the radio cell of the base station, or on channels which are specifically dedicated to only one specific mobile radio station). The MAC layer has tasks such as, for example, identifying the users for whom a data packet which has to be transmitted is destined if it is transmitted on general channels, and mapping logical transmission channels (LCS) to the transport channels (TCS). For this purpose, the MAC layer on the sending side adds control information such as the identity of the relevant mobile radio station, for example, to the data packets which must be transmitted, which it received from another higher layer RLC (RLC = Radio Link Control). This RLC layer is designated as RLC1 in the mobile radio station UE11. This RLC layer has the reference sign RLC2 in the base station BS1. In this case, the connections between the relevant MAC layer, e.g. MAC1 in the subscriber device UE11 and MAC2 in the radio network controller RNC1, and the relevant associated Radio Link Control layer RLC1 or RLC2 are designated as logical channels. In order to map the logical transmission channels onto the transport channels, the relevant MAC layer on the sending side adds control information such as the identity of the relevant mobile radio station, for example, to the data packets which must be transmitted and which it received from the relevant higher RLC layer. On the receiving side, this control information is analyzed and removed from the data packets again, and said data packets are then forwarded to the RLC layer via the logical connections.

The relevant RLC layer RLC1 or RLC2 is responsible in each case for monitoring the data transmission, i.e. for detecting missing data packets and requesting these again if necessary. A plurality of units can be defined in the RLC layer. In this case, each RLC unit has at least one connection between higher layers and RLC layer (e.g. Radio Bearer RB). The RLC layer on the sending side is also able to add control information to the packets which it receives from higher layers. This control information is used on the receiving side to assess whether packets are missing, for example. It is removed from the packets before these are forwarded again to

the higher layers. Above the RLC layer is the Radio Resource Control layer RRC. In detail, this is designated as RRC1 in the subscriber device UE11 and as RRC2 in the assigned radio network controller RNC1. The relevant RRC layer is responsible for the configuration of the layers below it and, above all, for the connection setup. The connections between the relevant RLC layer and the RRC layer are called SRBs (Signaling Radio Bearers) and are designated as RRC1 for the subscriber device UE11 and as SRB2 for the radio network controller RNC1.

The so-called RBs (Radio Bearers) are also situated above the relevant RLC layer, and are used for the actual data transmission and represent the connection between the RLC layer and the application above it. If packet data is transmitted, the so-called Packet Data Convergence layer (PDCP = Packet Data Convergence Protocol) also exists above the relevant RLC layer, e.g. PDCP1 for the subscriber device UE11 and PDCP2 for the radio network controller RNC1 in this case, and is responsible for e.g. the compression of IP (Internet Protocol) packets. Also situated above the RLC layer of the subscriber device UE11 and the radio network controller RNC1 of the base station BS1 in each case is the so-called Broadband Multicast Control layer BMC1 or BMC2 respectively (BMC = Broadband Multicast Controller), which is used for receiving any Cell Broadcast messages (CBS messages). As for the RLC layer, a plurality of BMC units can be defined in the BMC layer concerned.

In summary therefore, it can be stated that the transmission via the radio interface is implemented via so-called physical channels. The transmission services of the bit transmission layer or of the physical layer are performed via the transport channels at the service access points. Transport channels are characterized by the way in which the data is transmitted. The transmission services of the control layer or MAC layer are performed via the logical channels. Logical channels are characterized by the type of data that is transmitted. In this case, a distinction is made between control data and traffic data or user data.

Reference is made below to different logical channels and transport channels, and these should therefore be explained briefly here:

CBS messages are transmitted between RLC and MAC via a logical channel having the designation Common Traffic Channel CTCH. The CTCH is used for transmitting data of the user level to all subscriber terminals UEs (in particular UE11) or to a group of UEs. The CTCH is a unidirectional point-to-multipoint channel in the down-link section, said channel being mapped onto a transport channel or Forward Access Channel FACH. The FACH is a shared transport channel on the down-link section, said channel being used for transmitting relatively small quantities of data. The FACH is mapped onto a physical channel or radio channel accordingly, said channel having the designation Secondary Common Control Physical Channel (S-CCPCH). The S-CCPCH essentially carries information of the FACH and of one or more Paging Channels PCH. A physical channel or radio channel Primary Common Control Physical Channel (P-CCPCH) transmits the information of the BCH.

The logical channel Broadcast Control Channel BCCH is a shared channel of the down-link section, control data being broadcast on said channel to all UEs in a radio cell. This control data comprises, for example, the System Information Blocks (SIB). The BCCH is either mapped onto the FACH or onto the Broadcast Channel BCH.

A transmission of data with interrupted or so-called Discontinuous Reception DRX has already been described at the beginning as a known measure for e.g. reducing the energy requirements of the mobile radio device. DRX is used inter alia for the Cell Broadcast Service CBS which is specified in the UMTS. The system-internal planning for this, if frames or resources are available for CBS services and if these resources transport CBS messages, is made public by so-called scheduling information or planning messages. This planning is implemented in two stages:

The first stage of the planning (CB DRX Level 1) is to signal (within the first planning message or CB DRX Level 1 message) which transmission channel or which FACH (as at least one second separate transmission channel) is used and when messages are transmitted on this channel, i.e. which resources of the FACH or which frames of the S-CCPCH are actually reserved or assigned for the transmission of "Cell Broadcast" messages. This signaling should be transmitted to the RRC (RRC1) as part of the system information or system information messages via the cell-specific and logical channel BCCH (as first separate transmission channel). More precisely, information elements (IE) relating to this are defined and sent within the system information messages on the BCCH. The first planning message includes notification of how many frames and when frames are assigned for the transmission of Cell Broadcast messages. CBS messages can then be transmitted in these frames only.

The illustration in Figure 3 shows an example of the assignment of frames to the logical channel CTCH, via which the transmission of Cell Broadcast messages takes place. An offset of two frames to Frame Number 0, a periodicity of six frames for the allocated resources, and a quantity of two consecutive frames are assumed. Now a mobile terminal UE which wants to receive CBS messages no longer has to check every frame, but only the content of the frames having the numbers 2/3, 8/9, 14/15, etc. The processing effort within the UE is consequently reduced, thereby also reducing the energy requirements within it.

For CBS DRX, provision is made for the use of an index table in which an index is allocated to the sets of resources or frames, as shown by the illustration in Figure 4. It is then very easy to coordinate the assignment of the resources in the subsequent second stage of the planning or the second planning message via this index.

For the second stage of the planning (CBS DRX Level 2), a so-called "Inband Scheduling" message (inband planning message) or second planning message is transmitted together with the actual Cell Broadcast message on the logical channel CTCH and analyzed by the

BMC (BMC1). Various information is communicated to the UEs (UE11) in this second planning message or CBS DRX Level 2 message, indicating e.g. which of the CBS messages, i.e. the actual user data messages, include which topics or contents (e.g. weather information) and whether these messages or the information contained therein have changed since the last transmission. In this way, the terminal (UE11) then only receives CBS messages if either useful information which was not previously received is transmitted or DRX Level 2 information is transmitted once again. The Broadcast/Multicast Control (BMC, in Figure 2: BMC1 and BMC2) protocol [1] of the UMTS protocol stack is responsible for implementing the second DRX stage or the second planning message, and therefore the messages which are sent by this protocol can also be designated as "BMC" planning messages (BMC schedule messages).

In the second stage of the planning, the transmission time is divided into so-called time periods or DRX periods, and information about the CBS messages (user data messages) which are sent in the period is communicated [1] by the BMC planning messages or second planning messages at least once for each period. An example of a BMC planning message is illustrated in Figure 5. In addition to the "M-Type" information element for characterizing the message (i.e. indicating that it is a planning message and not a user data message, for example) and an "Off" information element relating to an offset for the first frame which is used for the transmission of CBS messages in the DRX period, this BMC planning message contains a "Len" information element relating to the length of the DRX period. The BMC planning message also includes a bitmap field "BitMap" which is shown here as an exemplary field having 7 bits and indicates by the setting of a bit, for each CBS message which is transmitted in the following DRX period, whether the message is new or was already transmitted. The BMC planning message also contains a list of message descriptions "M-Des", of which one in said list is present for each CBS message (user data message) in the following DRX period and features a message description type "MD-Type" which indicates e.g. whether the message is a repetition within the same DRX period or a new message and, depending on the MD-Type, a message

identification "M-ID" for new messages, which specifies the content of the message (e.g. weather information), or a reference to the first send time-point of the message in the case of repeated messages. It should be noted that arrows in the Figures 5 and 6 indicate a detailed description of an information element of a message.

When transmitting CBS messages or user data messages in the CBS, said CBS being specified in UMTS (see description above) or GSM (GSM: Global System for Mobile Communication), it is now conceivable additionally to provide for a transmission of messages having multimedia contents. Such a service can be designated generally as a "Multimedia Broadcast Service" (MBS). In order to prevent a specific subscriber device from attempting to receive or process user data messages whose content it can actually make useable (e.g. in the form of displays on a display of the subscriber device in the case of a transmitted color image, or playback in the case of an acoustic audio file), the following principle is proposed in accordance with an embodiment of the invention. Taking as a starting point the method as illustrated above for Discontinuous Reception of messages (DRX), an information or description information should be transmitted in the first and/or the second planning message, but preferably in the second planning message, indicating in which form or type the possibly coded user data is present in the user data messages which are to be transmitted, and therefore which capabilities a subscriber device must have in order to decode this data or make it usable for the user of the subscriber device (playback, display, etc.).

The advantage of this additionally transmitted description information is that a subscriber device limits the received user data messages not only to those messages which it has not yet received and whose content is of interest to the user of the subscriber device, but also to those messages which it is able to process and make usable for the user as a result of its device attributes or capabilities. A method for Discontinuous Reception (DRX) is therefore extended in such a way that a terminal also saves

reception energy by not receiving user data messages which it cannot decode or, for example, cannot display or playback. This means that if, on the basis of a description information in a (first and/or second) planning message, a subscriber device detects that it cannot process the user data which is contained in a user data message, the corresponding user data messages are not read or monitored from the announced transmission channel, thereby resulting in a reduction in the signal processing effort and therefore a reduction in the energy requirements.

With reference to Figure 6, the following explains a preferred embodiment of the invention of a method for Discontinuous Reception (DRX) within the framework of or as an extension to the Cell Broadcast Service which has been specified in relation to UMTS. Since the first stage of the Discontinuous Reception (DRX) is not changed in this case, only the second stage relating to the second planning message is described below.

Corresponding with the second planning message or BMC planning message which is illustrated in Figure 5, said message being as specified in UMTS, the second planning message as illustrated in Figure 6 also contains inter alia the following information for each CBS message or user data message which is sent in the subsequent DRX period on the transmission channel that is used for CBS:

- message is new or old ("BitMap");
- message should / must / need not be read ("MD-Type");
- message identification which specifies the content of the message, e.g. weather information ("M-ID").

This BMC planning message is now extended further to include a set of information elements (also designated as MCD: "Message Contents Description") for each CBS message or MBS message (user data message) in the subsequent DRX period, wherein said set of information elements contains the following information. As shown in Figure 6, in accordance with the advantageous configuration which is illustrated there, a relevant information field "M-Des(1, etc.)" was

extended in this case to include an information field "MCD" which has the following information element:

- type of data or data type, e.g. audio, video, text or image data (provided in the information element "Contents-Type" or abbreviated as "C-Type" in Figure 6);
- any parameters relating to the uncoded data, e.g. for images: dimensions in pixels horizontal / vertical (provided in the information element "C-Raw" in Figure 6);
- type of coding, e.g. for audio: none, MP3, AMR, WAV (provided in the information element "C-Cod" in Figure 6);
- any parameters relating to the coding (if required, depending on the coding) (provided in the information element "C-Param" in Figure 6).

It is noted that, instead of being assigned to the new information field "MCD", the information elements "C-Type", "C-Raw", "C-Cod", "C-Param" can also be assigned to another information field such as the information field "MD-Type" for the purpose of extending its information.

In the method of the second stage of the Discontinuous Reception, a BMC planning message of the type which is illustrated in Figure 6 is now transmitted to the subscriber devices via a suitable transmission channel as per the prior art. The subscriber devices which are able to receive CBS messages receive the BMC planning message, evaluate it, and initially decide in the conventional way which messages or contents or topics (e.g. weather news) are possible for reception.

From these messages, in accordance with the preferred embodiment of the invention, are then filtered out those which a subscriber device is not able to analyze, decode or make usable for the user as a result of its nature or capabilities (e.g. display size, decoding software, memory possibilities).

It is therefore possible that a user of a subscriber device firstly choose which message contents said user would like to receive, and possibly then selects which data type of user data is permitted or which coding is permitted for reception (e.g. uncoded text data only, in order to consume a minimum of energy and time for processing). The subscriber device can then allow for the wishes of the user and only receive or select those user data messages for which it is designed, i.e. for which it has been configured by the user, and possibly moreover those which it is actually able to process. A message transmission which is both efficient and optimized in terms of energy consumption is therefore guaranteed.

Finally, the following example is given for the preferred embodiment of the invention which is explained above. It is assumed that a subscriber device (such as a mobile phone) has an integrated MP3 player (e.g. as special software) and a display with a resolution of 50x50 pixels, but no video player (e.g. as special software). The subscriber device has been configured by the user in such a way that it will receive CBS or MBS messages which contain audio sequences, text and images, but not those containing the video sequences.

It is also assumed in this example that the user has effected settings for messages having an exemplary message ID of 4096.

It is now assumed that a CBS planning period includes three CBS or MBS messages having the message ID 4096, said messages being new and being received or read from a conventional subscriber device. The data in the messages is of the following type:

- Message 1: type - audio ("C-Type"), length = 10 seconds ("C-Raw"), coding = MP3 ("C-Cod");
- Message 2: type - video ("C-Type"), resolution = 50 x 50 and length = 10 seconds ("C-Raw"), coding = MPEG4 ("C-Cod");
- Message 3: type - image ("C-Type"), resolution = 150 x 100 ("C-Raw"), coding = JPEC ("C-Cod").

In accordance with an embodiment of the invention, a subscriber device decides, on the basis of its capabilities, that Message 1 will be received so that it can be played if the user wishes to do so. It is also decided not to receive Message 2 since video data cannot be displayed. Message 3 is only received if the terminal offers a possibility for scrolling larger images on the smaller display or for showing the image in a reduced size.

It is noted that the principles as described above (in relation to the introduction of a planning information which specifies the form, i.e. data type and/or coding, of the user data messages which must be transmitted) of the method for the Discontinuous Reception (DRX) of user data messages in relation to a Cell Broadcast Service can also be applied to a method for the Discontinuous Reception (DRX) of user data messages in relation to multicast (MC) or a multicast service, in particular in the UMTS.

Such a method including use of a Discontinuous Reception (DRX) for multicast services is subsequently designated as MC DRX, wherein Discontinuous Reception (DRX) is as described above.

In a manner which is comparable to the CBS, corresponding messages announce the planning for MC DRX, which resources are available for MC services, and when these resources transport multicast messages. For this purpose, the messages for the planning and assignment of the resources contain inter alia information about the multicast groups. In an embodiment, the multicast groups are indexed by means of an MC address or an MC group identity.

So-called "Scheduling Messages" or planning messages in turn announce the planning for MC DRX, on which transmission channels, i.e. physical channels or transport channels, when frames or resources are available for MC services, and when these resources transport multicast messages. The various UMTS protocol layers are configured by the radio resource controller RRC on the basis of these planning messages. Therefore the physical level is already aware of the resources in which an MC message or further planning

messages can be expected at all. Moreover, by analyzing further information, the BMC layer can decide which MC messages should actually be received. Like the CBS, the planning is implemented in two stages as described below:

The first stage of the planning, MC DRX Level 1, signals which physical channels and transport channels are used for the transmission of planning information when preparing the transmission of an MC message. Unlike the CBS, the CTCH for MC services is optionally also mapped onto transport channels other than the FACH and onto physical channels other than the S_CCPCH. Moreover, the MC DRX Level 1 message or first planning message also contains information elements indicating which frames of the physical channels are reserved or assigned for the transmission of further planning information.

This signaling is transmitted to the RRC via the logical channel BCCH as part of the system information. Within the MC DRX Level 1 message, it is therefore stated where, how many, and particularly when resources are assigned for the transmission of multicast (MC messages (user data messages). MC messages can then be transmitted in these frames only.

An index table corresponding to that in Figures 3 and 4 can again be used for MC DRX, allocating indices to the sets of resources in combination with the used physical channels and transport channels. Consequently, the assignment of resources in the subsequent second stage of the planning is made very easy by these indices.

For the second stage of the planning, MC DRX Level 2, a so-called "Inband Scheduling Message" or second planning message together with the actual MC message is again transmitted and analyzed by the BMC. Various information corresponding to the Figures 5 and 6 in relation to the CBS is transferred to the subscriber terminals (UE11, UE21, etc.) in this MC DRX Level 2 message.

In case the existing DRX for CBS is extended by the functionality for supporting MC DRX, an information element is introduced into the second planning message and is used to distinguish whether the reserved resources are resources for broadcast or multicast services. The information field "Message Type" or "M-Type" can be used, for example, to distinguish between a CBS message, MC message, planning message, etc.

In order to implement a method for user data transmission in the MC DRX according to an embodiment of the invention, it is however important to introduce an information element relating to the form of the user data message into one of the two planning messages and particularly into the second planning message, e.g. in the manner which has been described with reference to Figure 6 using the information elements "C-Type", "C-Raw", C-Cod" and "C-Param".

A summary of background information, inter alia about the protocols used in the present application, can be found in particular in the following sources:

[1] 3GPP TS 25.324 V3.4.0, Broadcast/Multicast Control BMC, Release 1999;

[2] 3GPP 25.211, Physical Channels and mapping or transport channels onto physical channels, Release 99.

Claims

1. Method for transmitting user data messages from a network element (BS1) of a radio communication system (FCS) over at least one transmission channel (PCS) to one or more subscriber devices (UE11, UE21, UE31, UE42) of the radio communication system (FCS), wherein the form of the user data messages is announced by means of a planning information (BMC planning message; C-Type, C-Raw, C-Cod, C-Param) before their transmission.

2. Method according to Claim 1, wherein the planning information comprises a first planning message by means of which the transmission of the user data messages is announced via a first separate transmission channel, and a second planning message (BMC planning message) by means of which a description information (C-Type, C-Raw, C-Cod, C-Param) specifying the form of the user data messages that are to be transmitted is transmitted via at least one second separate transmission channel.

3. Method according to one of the Claims 1 or 2, wherein the form of the user data messages which are to be transmitted includes the data type (C-Type) and/or the coding (C-Cod) of the user data messages.

4. Method according to Claim 3, wherein the data type includes a text, image, audio or video format.

5. Method according to one of the Claims 3 to 4, wherein the coding includes an MP3 format, AMR format, WAV format, JPEG format or an MPEG4 format.

6. Method according to one of the Claims 1 to 5, wherein the description information relating to the user data messages also includes parameters (C-Raw) which refer to the data volume, the image dimensions for image and/or video data, or the playback duration for audio and/or video data.

7. Method according to one of the Claims 1 to 6, which is carried out in the framework of a broadcast service, in particular as an extension of a Cell Broadcast Service (CBS), or a multicast service.

8. Method according to Claim 1 or 7, wherein the radio communication system (FCS) is operated in accordance with the UMTS standard.

9. Method according to one of the Claims 2 to 8, wherein the first planning message contains information about when and on which second separate transmission channel, of which there is at least one, second planning messages and/or user data messages are transmitted.

10. Method according to one of the Claims 1 to 9, wherein the subscriber device or plurality of subscriber devices (UE11, UE21, UE31, UE42) receives only those user data messages which it is designed to process.

11. Method according to one of the Claims 1 to 10, wherein a mobile radio device, in particular a mobile phone, is used as a subscriber device (UE11, UE21, UE31, UE42).

12. Method according to one of the preceding claims, wherein the subscriber device or plurality of subscriber devices (UE11, UE21, UE31, UE42) receives only those user data messages which, having regard to the announced form, it is able to process.

13. A subscriber device (UE11, UE21, UE31, UE42) of a radio communication system (FCS), which subscriber device is designed in such a way that it can be operated in accordance with a method as per the Claims 1 to 12.

14. A radio communication system (FCS) for carrying out the method in accordance with one of the Claims 1 to 12.

Claims (clean copy)

1. Method for transmitting user data messages from a network element (BS1) of a radio communication system (FCS) over at least one transmission channel (PCS) to one or more subscriber devices (UE11, UE21, UE31, UE42) of the radio communication system (FCS), wherein the form of the user data messages is announced by means of a planning information (BMC planning message; C-Type, C-Raw, C-Cod, C-Param) before their transmission, wherein the form of the user data messages which are to be transmitted includes the data type (C-Type) and/or the coding (C-Cod) of the user data messages.

2. Method according to Claim 1, wherein the planning information comprises a first planning message by means of which the transmission of the user data messages is announced via a first separate transmission channel, and a second planning message (BMC planning message) by means of which a description information (C-Type, C-Raw, C-Cod, C-Param) specifying the form of the user data messages that are to be transmitted is transmitted via at least one second separate transmission channel.

3. Method according to Claim 1, wherein the data type includes a text, image, audio or video format.

4. Method according to one of the Claims 1 to 3, wherein the coding includes an MP3 format, AMR format, WAV format, JPEG format or an MPEG4 format.

5. Method according to Claim 2, wherein the description information relating to the user data messages also includes parameters (C-Raw) which refer to the data volume, the image dimensions for image and/or video data, or the playback duration for audio and/or video data.

6. Method according to one of the Claims 1 to 5, which is carried out in the framework of a broadcast service, in particular as an extension of a Cell Broadcast Service (CBS), or a multicast service.

7. Method according to Claim 1 or 6, wherein the radio communication system (FCS) is operated in accordance with the UMTS standard.

8. Method according to one of the Claims 2 or 5, wherein the first planning message contains information about when and on which second separate transmission channel, of which there is at least one, second planning messages and/or user data messages are transmitted.

9. Method according to one of the Claims 1 to 8, wherein the subscriber device or plurality of subscriber devices (UE11, UE21, UE31, UE42) receives only those user data messages which it is designed to process.

10. Method according to one of the Claims 1 to 9, wherein a mobile radio device, in particular a mobile phone, is used as a subscriber device (UE11, UE21, UE31, UE42).

11. Method according to one of the preceding claims, wherein the subscriber device or plurality of subscriber devices (UE11, UE21, UE31, UE42) receives only those user data messages which, having regard to the announced form, it is able to process.

12. A subscriber device (UE11, UE21, UE31, UE42) of a radio communication system (FCS), in which user data messages are transmitted over at least one transmission channel (PCS) to the subscriber device, and the form of said user data messages is announced by means of a planning information (BMC planning message; C-Type, C-Raw, C-Cod, C-Param) before their transmission, wherein the form of the user data messages which are to be transmitted includes the data type (C-Type) and/or the coding (C-Cod) of the user data messages, wherein the subscriber device is designed in such a way that it receives only those user data messages which, having regard to the announced form, it is able to process.

14. A radio communication system (FCS) having the following features:
one or more subscriber devices;
a network element which is configured for transmitting user data messages over at least one transmission channel (PCS) to the subscriber device or plurality of subscriber devices (UE11, UE21, UE31, UE42), wherein the form of the user data messages is announced by means of a planning information (BMC planning message; C-Type, C-Raw, C-Cod, C-Param) before their transmission, wherein the form of the user data messages which are to be transmitted includes the data type (C-Type) and/or the coding (C-Cod) of the user data messages.

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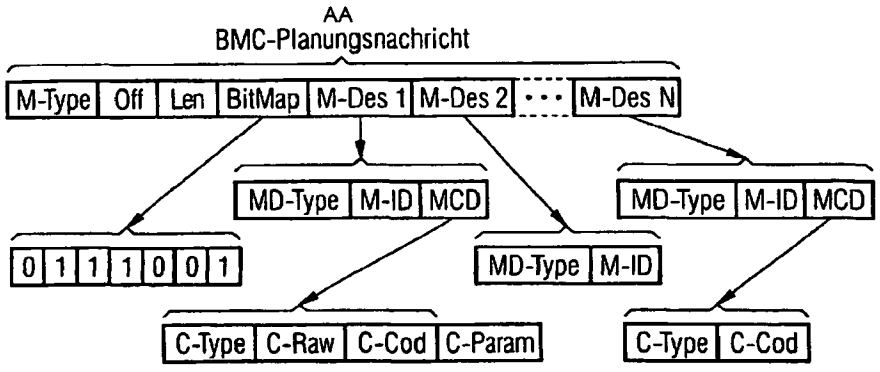
[Fortsetzung auf der nächsten Seite]

(54) Title: METHOD, SUBSCRIBER TERMINAL AND RADIO COMMUNICATION SYSTEM FOR TRANSMITTING USER DATA MESSAGES

(54) Bezeichnung: VERFAHREN, TEILNEHMERGERÄT SOWIE FUNKKOMMUNIKATIONSSYSTEM ZUM ÜBERTRAGEN VON NUTZDATENNACHRICHTEN



AA... BMC-PLANNING MESSAGE

(57) **Abstract:** The invention relates to a method for transmitting user data messages from a network element of a radio communication system via at least one transmission channel to at least one subscriber terminal of the radio communication system, whereby the form of the user data messages is announced before the transmission thereof by means of planning information (BMC-planning message; C-Type, C-Raw, C-Cod, C-Param). Said planning information especially comprises a first planning message by which means the transmission of the user data messages is announced via a first separate transmission channel, and a second planning message (BMC-planning message) by which means description information (C-Type, C-Raw, C-Cod, C-Param) is transmitted via at least one second transmission channel, said description information indicating the form of the user data messages to be transmitted. The form of the user data messages to be transmitted can include the data type (C-Type) and/or the codification (C-Cod) of the user data messages. Announcing the form of the user data messages in the planning information enables the subscriber terminal to only intercept or receive the user data messages that it can actually process, thus enabling energy to be saved during reception and processing.

[Fortsetzung auf der nächsten Seite]

WO 2004/017649 A1

FIG 1

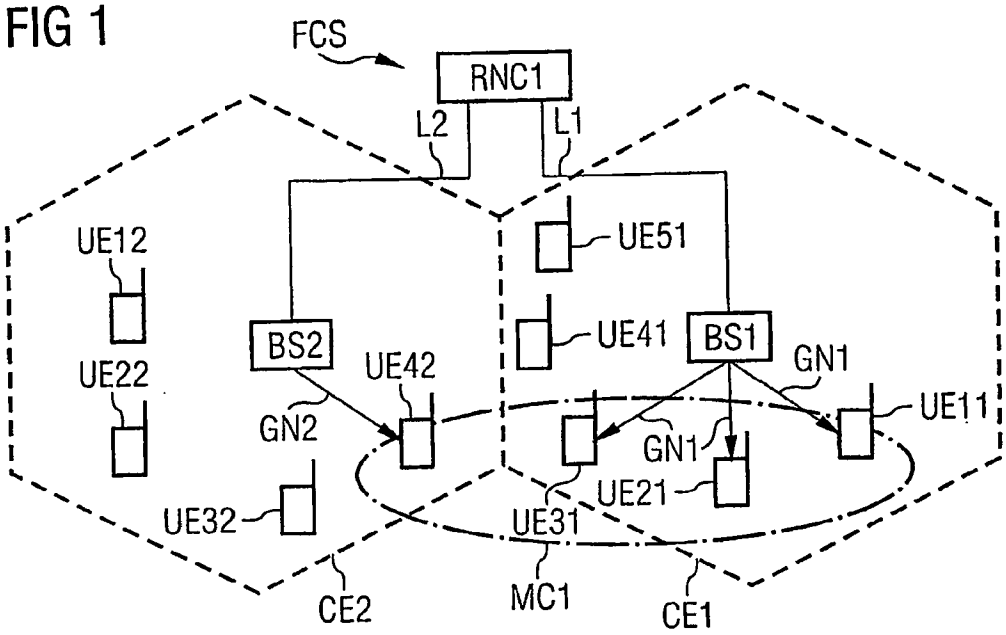


FIG 2

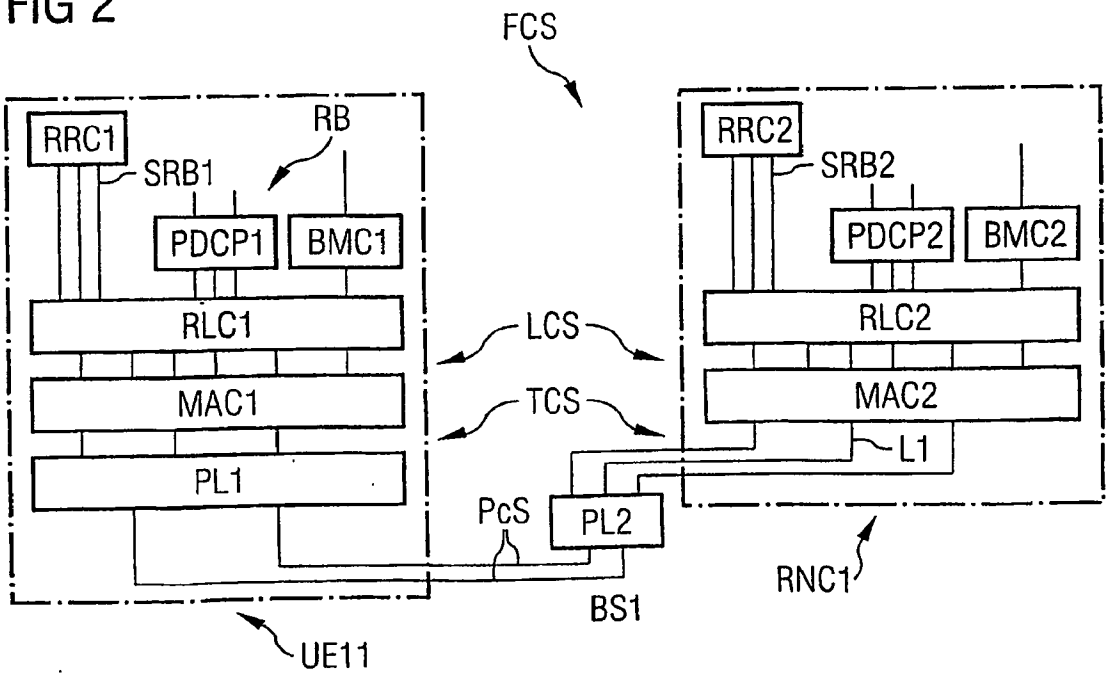


FIG 3

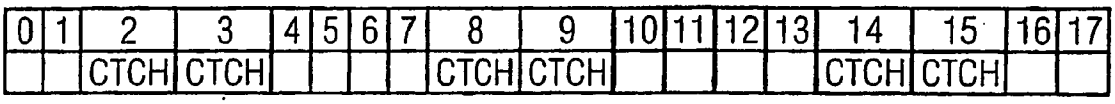


FIG 4

Frame numbers	CFCH resource index
2,3	1
8,9	2
14,15	3
20,21	4
26,27	5
32,33	6
...	...

FIG 5

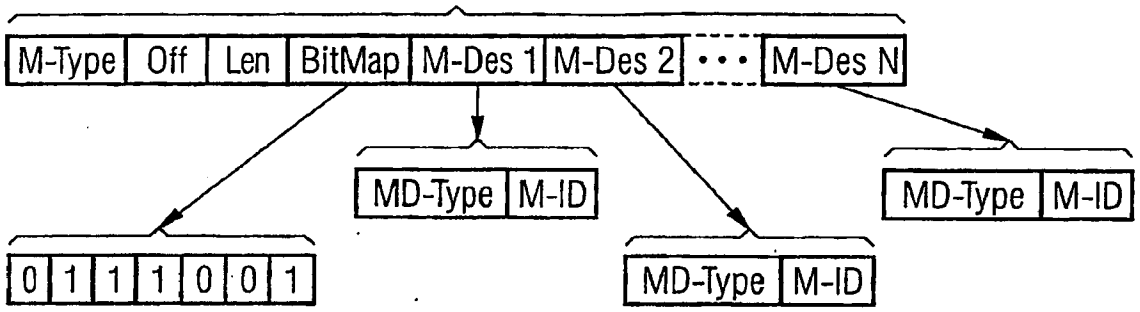
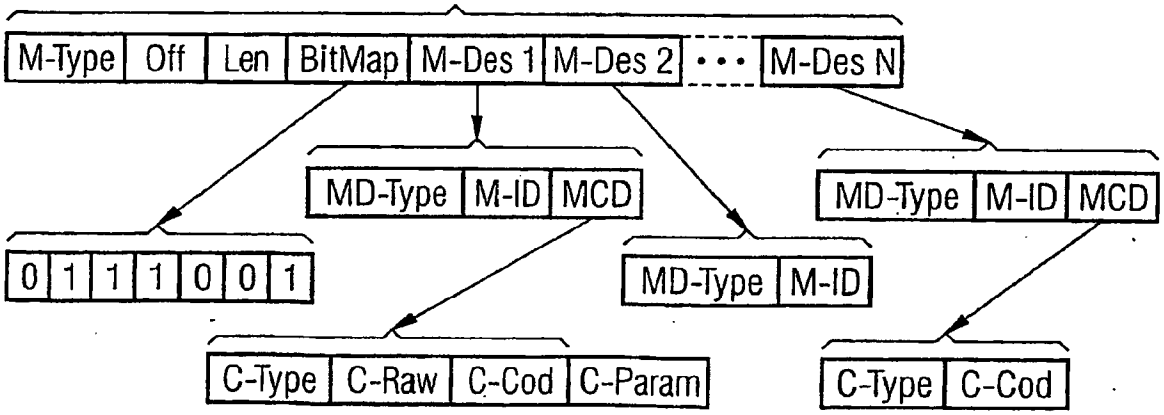


FIG 6



IN THE UNITED STATES ELECTED/DESIGNATED OFFICE OF THE UNITED STATES PATENT AND TRADEMARK OFFICE UNDER THE PATENT COOPERATION TREATY

Applicant(s):	Andreas Otte et al.
Intnl. Appl. No.:	PCT/DE2003/002381
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Title:	METHOD, SUBSCRIBER DEVICE AND RADIO COMMUNICATION SYSTEM FOR TRANSMITTING USER DATA MESSAGE
Docket No.:	0112740-1050

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PRELIMINARY AMENDMENT

Sir:

Please amend the above-identified International Application before entry into the National stage before the U.S. Patent and Trademark Office under 35 U.S.C. §371 as follows:

Amendments to the Specification begin on page 2 of this paper.

Amendments to the Claims are reflected in the listing of claims which begins on page 42 of this paper.

Remarks begin on page 45 of this paper.

Amendments to the Specification:

Please replace the Specification of the present application, including the Abstract, with the following Substitute Specification. A marked-up version of the Substitute Specification and Abstract is attached hereto.

SPECIFICATION

TITLE OF THE INVENTION

METHOD, SUBSCRIBER DEVICE AND RADIO COMMUNICATION SYSTEM FOR TRANSMITTING USER DATA MESSAGES

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a method for transmitting user data messages, from a sender to one or more recipients, a subscriber device and a radio communication system.

[0002] In the case of many services and applications which are offered in modern mobile radio systems, messages must be transmitted to not just one subscriber, but to two or more subscribers. Such services and applications include, for example, news groups, video conferences, video on demand, distributed applications, etc.

[0003] When transmitting the messages to the different subscribers, it is possible to send a copy of the data to each recipient separately. Although this technique is easy to implement, it is unsuitable for large groups. Because the same message is transmitted over N individual connections or unicast connections (N corresponds to the number of recipients) and is therefore sent multiple times over shared connection paths, this method requiring a very high bandwidth.

[0004] A more advantageous possibility is offered by multicast (group call) transmission. Here, the different subscribers to whom the same message is to be transmitted are combined into a multicast group, and the multicast group is assigned an address which is specifically known as a multicast address. The data which must be transmitted is only sent once to this multicast address accordingly. In an ideal case, the multicast message is sent only once over shared connection paths from the sender to the recipients. It is not necessary for the sender to know where and how many recipients are hiding behind the multicast address.

[0005] In the case of broadcast (collective call), messages are sent to all subscribers within a geographical area. Such an area can be specified as a part of the overall network, for example. As in the case of multicast, the broadcast message is ideally sent only once over shared connection paths from the sender to the

recipients. Each subscriber must implement enabling settings at the local terminal if the subscriber wishes subsequently to analyze broadcast packets from a corresponding broadcast group. In this way, individual subscribers can specify whether they wish to receive or discard all broadcast messages, or whether they wish to receive specific messages only.

[0006] As part of a known method for data communication, a specific quantity of frames is typically always exchanged between a network and a mobile radio device within a specific time. In this case, a frame is a time-relative structure, upon which in a UMTS (Universal Mobile Telecommunications System), for example, the entire signal processing and data transmission is based, see [2].

[0007] If all these frames are continuously transmitted and received by the mobile radio device, this is known as continuous transmission or continuous reception. However, it is also possible during the transmission to use an interrupted (discontinuous) reception, namely Discontinuous Reception DRX, in order to reduce the energy requirements of the mobile radio devices, for example. When using DRX, the frames are not continuously transmitted and received by the mobile radio devices, but specific frames are omitted. In this mode, however, at least a specific subset of all frames or a subset of the possible frames must be transmitted in order to maintain the connection.

[0008] In the context of transmitting messages or data to various subscribers, it is now also conceivable to provide for a transmission of messages having multimedia content. A problem may arise here, however, in that not all data types of transmitted multimedia messages can be processed by every subscriber device. In this case, it is then possible for a subscriber device to use resources and energy for receiving specific multimedia messages containing audio and video data, and for it then to transpire when processing the messages that the subscriber device is not designed to process or playback video data at all. In such a case, energy is wasted for no purpose and the service life of the subscriber device is reduced.

[0009] The present invention is therefore directed toward a way of providing an efficient, resource-saving, energy-saving transmission of data or messages to one or more recipients of a point-to-multipoint service.

SUMMARY OF THE INVENTION

[0010] According to a method for transmitting user data messages from a network element of a radio communication system over at least one transmission channel to one or more subscriber devices of the radio communication system, the form of the user data messages is announced via planning information before their transmission. In particular, the form in relation to the processing of the user data messages by the subscriber device or subscriber devices is announced in this context. An advantage of such a method is that the subscriber device or devices know from the announcement of the form of the user data messages, even before the user data messages are actually transmitted or received, whether such subscriber device or devices are capable of processing the user data messages in such a way that they are useful to the user of the subscriber device (displaying a picture which is contained in the user data messages, playing an audio file, etc.). As such, on the basis of the planning information, the subscriber device or devices can decide to receive only those user data messages which they are also capable of processing, thereby making it possible to save both resources and energy on the subscriber devices.

[0011] According to an embodiment, the method is implemented as a two-stage method, wherein the planning information is transmitted to the subscriber device or devices via two separate planning messages. The transmission of the user data messages is announced by a first planning message via a first separate transmission channel. More precisely, the first planning message may contain information about when or on which second separate transmission channel, of which there is at least one, second planning messages or user data messages will be transmitted. Description information, which specifies the form of the user data messages which are to be transmitted, is then transmitted via the announced second separate transmission channel, of which there is at least one, by the second planning message.

[0012] According to a further embodiment, the form of the user data messages which are to be transmitted may include the data type as well as the coding of the user data messages. In this case, the data type can be a text, image,

audio or video format, etc. The coding may include an MP3 (Moving Pictures Experts Group Layer-3 Audio) format, AMR (Adaptive Multi-Rate) format, WAV (Windows Wave) format, JPEG (Joint Photographic Experts Group) format or an MPEG4 (Motion Picture Experts Group 4) format. It is also possible for the description information relating to the uncoded or coded user data messages to further include parameters which refer to, for example, the data volume, the image dimensions in the case of image and/or video data, or the playback duration in the case of audio and/or video data.

[0013] According to a further advantageous configuration, the method for transmitting user data, particularly in the two-stage configuration, can be carried out in the framework of a broadcast service, in particular as an extension of a Cell Broadcast Service (CMS) or a multicast service. In this context, the method is used as an extension of a Cell Broadcast Service, as specified in UMTS, which would require the radio communication system to be operated in accordance with the UMTS standard.

[0014] As mentioned above, the subscriber device or subscriber devices can analyze the planning information, particularly the second planning message or the description information which is contained therein relating to the user data messages that have to be transmitted, and therefore may receive or monitor from the second transmission channel, of which there is at least one, only those user data messages which it is, or they are, designed to process. In this way, the processing effort and, therefore, the energy consumption in a subscriber device is restricted.

[0015] According to another embodiment, a mobile radio device, in particular a mobile phone, is used as a subscriber device.

[0016] According to a further embodiment of the present invention, a subscriber device is produced for a radio communication system, with the subscriber device being designed in such a way that it can be operated in accordance with one of the methods described above.

[0017] According to yet another embodiment of the present invention, a radio communication system is produced for carrying out one of the methods described above.

[0018] Additional features and advantages of the present invention are described in, and will be apparent from, the following Detailed Description of the Invention and the Figures.

BRIEF DESCRIPTION OF THE FIGURES

[0019] Figure 1 shows a schematic illustration of components of a radio communication system for notifying a group of one or more subscriber device.

[0020] Figure 2 shows a schematic illustration of a layered model of the protocols on the radio interface between a subscriber device and the responsible base station in the radio cell of the subscriber device in the radio communication system according to Figure 1, particularly according to the UMTS standard.

[0021] Figure 3 shows an assignment of frames to a logical channel CTCH, via which the transmission of Cell Broadcast Messages takes place.

[0022] Figure 4 shows an index table, as used for a Cell Broadcast Service (CBS) in Discontinuous Reception (DRX) mode, for the purpose of allocating an index to the quantities or sets of resources or frames.

[0023] Figure 5 shows a schematic illustration of the components of a conventional BMC planning message or second planning message.

[0024] Figure 6 shows a schematic illustration of the components of a BMC planning message or second planning message, which is extended in accordance with a preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0025] Figure 1 shows an exemplary schematic illustration of two radio cells CE1, CE2 of a radio communication system FCS which is operated, in particular, according to the UMTS (Universal Mobile Telecommunications System) standard. In terms of radio functionality, the radio cell CE1 is covered by the base station BS1 in this case, while the second radio cell CE2 is supplied by the base station BS2. These two base stations BS1, BS2 are representative of a multiplicity of further base stations of the radio communication system FCS, which further base stations are not illustrated in Figure 1 but include and cover the corresponding radio cells. The relevant base station is preferably formed by at least one radio transmitter and at least one radio receiver. It preferably has at least one transmitter antenna. In

addition to or independently of its function of providing a radio connection to subscriber devices of the radio communication system FCS, the relevant base station can be responsible for the transmission in each case of data/messages to a fixed message/data network that may be present.

[0026] Within the radio communication system FCS, message/data signals are transmitted via at least one predefined radio interface between at least one subscriber device, particularly a mobile radio device (e.g., a mobile phone) and at least one base station, preferably in accordance with a Time Division Multiple Access transmission method. It is preferably developed as a mobile radio system according to the UMTS standard. In particular, it is operated in so-called FDD mode (FDD: Frequency Division Duplex). In FDD mode, a separate signal transmission is achieved in up-link and down-link directions (up-link = signal transmission from the mobile radio device to the relevant base station; down-link = signal transmission from the relevant assigned base station to the mobile radio device) by a corresponding separate assignment of frequencies or frequency ranges. A number of subscribers in the same radio cell are preferably separated by orthogonal codes, particularly in accordance with the so-called CDMA method (CDMA: Code Division Multiple Access).

[0027] Subscriber devices preferably take the form of mobile radio device; e.g., mobile radio telephones and in particular, mobile phones. However, components of the radio communication network also may include subscriber devices in the form of other message and/or data transmission devices (e.g., internet-compatible terminals, computers, televisions, notebooks, fax devices, etc.) having an assigned radio unit for communication traffic "on air," i.e., at least one radio interface. The subscriber devices are often mobile or portable in this case (i.e., are used at different locations in the radio network), but also may be permanently configured at a location if required.

[0028] In Figure 1, the two base stations BS1, BS2 are controlled or monitored by a supervisory radio network controller RNC1 via associated data lines L1, L2. Such controller monitors the assignment of radio resources in the radio cells CE1, CE2 of the base stations BS1, BS2. In the present exemplary

embodiment, a multiplicity of subscriber devices UE11 to UE51 are located in the radio cell CE1 of the base station BS1. Likewise, a number of subscriber devices UE12 to UE42 are currently present in the second radio cell CE2 of the base station BS2. The subscriber devices UE11, UE21, UE31 in the first radio cell CE1 and the subscriber device UE42 in the second radio cell CE2 are assigned in advance to a predefinable group MC1, for which the receipt of one or more group messages must be enabled in the most efficient way possible.

[0029] Within the framework of the present invention, the term "group of subscriber devices" is preferably understood to refer to a classification according to technical service; i.e., particularly a division according to those subscriber devices which allow a multicast transmission or a broadcast transmission, for example. Furthermore, the subscriber devices in the radio cells of the radio communication network also may be sorted or divided according to a multiplicity of other criteria, particularly group message type, such as sport messages, weather forecasts, etc., or reason for occurrence, for example.

[0030] In the case of many services and applications which are offered in modern mobile radio systems, it is particularly desirable to transmit messages to not just one but to two or more mobile radio subscribers. Examples of such services and applications are news groups, video conferences, video-on-demand, distributed applications, etc.

[0031] The protocol stack or layered model of the protocols on the radio interface in UMTS is illustrated in Figure 2, by way of example, for the subscriber device UE11 in the radio cell CE1 of the base station BS1. The mobile radio station UE11 has a physical layer PL1, which is responsible on the sending side for processing the data for transmission via the radio interface via physical channels PCS, and on the receiving side forwards the received data to the Medium Access Control layer MAC1 (MAC = Medium Access Control), which exists above it, in such a way that it can be further processed by such layer. On the network side, the physical layer PL2 is situated in the base station BS1 which is connected to the radio network controller RNC1 via a fixed network connection. The connections between the physical layer and the MAC layer are called transport channels and

specify how the data is transmitted (e.g., on general channels which are heard by every mobile radio device in the radio cell of the base station, or on channels which are specifically dedicated to only one specific mobile radio station). The MAC layer has tasks such as, for example, identifying the users for whom a data packet which has to be transmitted is destined if it is transmitted on general channels, and mapping logical transmission channels (LCS) to the transport channels (TCS). For this purpose, the MAC layer on the sending side adds control information such as the identity of the relevant mobile radio station, for example, to the data packets which must be transmitted, which it received from another higher layer RLC (RLC = Radio Link Control). This RLC layer is designated as RLC1 in the mobile radio station UE11, and has the reference sign RLC2 in the base station BS1. In this case, the connections between the relevant MAC layer (e.g., MAC1 in the subscriber device UE11 and MAC2 in the radio network controller RNC1) and the relevant associated Radio Link Control layer RLC1 or RLC2 are designated as logical channels. In order to map the logical transmission channels onto the transport channels, the relevant MAC layer on the sending side adds control information such as the identity of the relevant mobile radio station, for example, to the data packets which must be transmitted and which it received from the relevant higher RLC layer. On the receiving side, such control information is analyzed and removed from the data packets again, and the data packets are then forwarded to the RLC layer via the logical connections.

[0032] The relevant RLC layer RLC1 or RLC2 is responsible, in each case, for monitoring the data transmission; i.e., for detecting missing data packets and requesting these again if necessary. A number of units can be defined in the RLC layer. In this case, each RLC unit has at least one connection between higher layers and RLC layer (e.g., Radio Bearer RB). The RLC layer on the sending side is also able to add control information to the packets which it receives from higher layers. This control information is used on the receiving side to assess whether packets are missing, for example. The control information is removed from the packets before they are forwarded again to the higher layers. Above the RLC layer is the Radio Resource Control layer RRC. In detail, this is designated as RRC1 in the subscriber

device UE11 and as RRC2 in the assigned radio network controller RNC1. The relevant RRC layer is responsible for the configuration of the layers below it and, above all, for the connection setup. The connections between the relevant RLC layer and the RRC layer are called SRBs (Signaling Radio Bearers) and are designated as RRC1 for the subscriber device UE11 and as SRB2 for the radio network controller RNC1.

[0033] The so-called RBs (Radio Bearers) are also situated above the relevant RLC layer, and are used for the actual data transmission, and represent the connection between the RLC layer and the application above it. If packet data is transmitted, the so-called Packet Data Convergence layer (PDCP = Packet Data Convergence Protocol) also exists above the relevant RLC layer (e.g., PDCP1 for the subscriber device UE11 and PDCP2 for the radio network controller RNC1 in this case) and is responsible, for example for the compression of IP (Internet Protocol) packets. Also situated above the RLC layer of the subscriber device UE11 and the radio network controller RNC1 of the base station BS1 in each case is the so-called Broadband Multicast Control layer BMC1 or BMC2, respectively (BMC = Broadband Multicast Controller), which is used for receiving any Cell Broadcast messages (CBS messages). As for the RLC layer, a number of BMC units can be defined in the BMC layer concerned.

[0034] In summary, therefore, it can be stated that the transmission via the radio interface is implemented via so-called physical channels. The transmission services of the bit transmission layer or the physical layer are performed via the transport channels at the service access points. Transport channels are characterized by the way in which the data is transmitted. The transmission services of the control layer or MAC layer are performed via the logical channels. Logical channels are characterized by the type of data that is transmitted. In this case, a distinction is made between control data and traffic data or user data.

[0035] Reference is made below to different logical channels and transport channels, which are explained briefly here.

[0036] CBS messages are transmitted between RLC and MAC via a logical channel having the designation Common Traffic Channel CTCH. The CTCH is

used for transmitting data of the user level to all subscriber terminals UEs (in particular UE11) or to a group of UEs. The CTCH is a unidirectional point-to-multipoint channel in the down-link section, the channel being mapped onto a transport channel or Forward Access Channel FACH. The FACH is a shared transport channel on the down-link section, the channel being used for transmitting relatively small quantities of data. The FACH is mapped onto a physical channel or radio channel accordingly, the channel having the designation Secondary Common Control Physical Channel (S-CCPCH). The S-CCPCH essentially carries information of the FACH and of one or more Paging Channels PCH. A physical channel or radio channel Primary Common Control Physical Channel (P-CCPCH) transmits the information of the BCH.

[0037] The logical channel Broadcast Control Channel BCCH is a shared channel of the down-link section, with control data being broadcast on the channel to all UEs in a radio cell. This control data includes, for example, the System Information Blocks (SIB). The BCCH is either mapped onto the FACH or onto the Broadcast Channel BCH.

[0038] A transmission of data with interrupted or so-called Discontinuous Reception DRX has already been described at the beginning as a known measure for, for example, reducing the energy requirements of the mobile radio device. DRX is used inter alia for the Cell Broadcast Service CBS which is specified in the UMTS. The system-internal planning for this, if frames or resources are available for CBS services and if these resources transport CBS messages, is made public by so-called scheduling information or planning messages. This planning is implemented in two stages.

[0039] The first stage of the planning (CB DRX Level 1) is to signal (within the first planning message or CB DRX Level 1 message) which transmission channel or which FACH (as at least one second separate transmission channel) is used and when messages are transmitted on such channel; i.e., which resources of the FACH or which frames of the S-CCPCH are actually reserved or assigned for the transmission of "Cell Broadcast" messages. This signaling should be transmitted to the RRC (RRC1) as part of the system information or system

information messages via the cell-specific and logical channel BCCH (as first separate transmission channel). More precisely, information elements (IE) relating to this are defined and sent within the system information messages on the BCCH. The first planning message includes a notification of how many frames, and when frames, are assigned for the transmission of Cell Broadcast messages. CBS messages then may be transmitted in these frames only.

[0040] The illustration in Figure 3 shows an example of the assignment of frames to the logical channel CTCH, via which the transmission of Cell Broadcast messages takes place. An offset of two frames to Frame Number 0, a periodicity of six frames for the allocated resources, and a quantity of two consecutive frames are assumed. Now a mobile terminal UE which wants to receive CBS messages no longer has to check every frame, but only the content of the frames having the numbers 2/3, 8/9, 14/15, etc. The processing effort within the UE is consequently reduced, thereby also reducing the energy requirements within it.

[0041] For CBS DRX, provision is made for the use of an index table in which an index is allocated to the sets of resources or frames, as shown by the illustration in Figure 4. It is then very easy to coordinate the assignment of the resources in the subsequent second stage of the planning or the second planning message via such index.

[0042] For the second stage of the planning (CBS DRX Level 2), a so-called "Inband Scheduling" message (inband planning message) or second planning message is transmitted together with the actual Cell Broadcast message on the logical channel CTCH and analyzed by the BMC (BMC1). Various information is communicated to the UEs (UE11) in this second planning message or CBS DRX Level 2 message, indicating, for example, which of the CBS messages, i.e., that is the actual user data messages, include which topics or contents (e.g. weather information) and whether these messages or the information contained therein have changed since the last transmission. In this way, the terminal (UE11) only receives CBS messages if either useful information which was not previously received is transmitted or DRX Level 2 information is transmitted once again. The Broadcast/Multicast Control (BMC, in Figure 2: BMC1 and BMC2) protocol [1] of

the UMTS protocol stack is responsible for implementing the second DRX stage or the second planning message, wherein the messages which are sent by the protocol also may be designated as "BMC" planning messages (BMC schedule messages).

[0043] In the second stage of the planning, the transmission time is divided into so-called time periods or DRX periods, and information about the CBS messages (user data messages) which are sent in the period is communicated [1] by the BMC planning messages or second planning messages at least once for each period. An example of a BMC planning message is illustrated in Figure 5. In addition to the "M-Type" information element for characterizing the message (i.e. indicating that it is a planning message and not a user data message, for example) and an "Off" information element relating to an offset for the first frame which is used for the transmission of CBS messages in the DRX period, this BMC planning message contains a "Len" information element relating to the length of the DRX period. The BMC planning message also includes a bitmap field "BitMap" which is shown here as an exemplary field having 7 bits and indicates by the setting of a bit, for each CBS message which is transmitted in the following DRX period, whether the message is new or was already transmitted. The BMC planning message also contains a list of message descriptions "M-Des," of which one in the list is present for each CBS message (user data message) in the following DRX period and features a message description type "MD-Type" which indicates, for example, whether the message is a repetition within the same DRX period or a new message and, depending on the MD-Type, a message identification "M-ID" for new messages, which specifies the content of the message (e.g., weather information), or a reference to the first send time-point of the message in the case of repeated messages. It should be noted that arrows in Figures 5 and 6 indicate a detailed description of an information element of a message.

[0044] When transmitting CBS messages or user data messages in the CBS, the CBS being specified in UMTS (see description above) or GSM (GSM: Global System for Mobile Communication), it is additionally possible to provide for a transmission of messages having multimedia contents. Such a service can be designated generally as a "Multimedia Broadcast Service" (MBS). In order to

prevent a specific subscriber device from attempting to receive or process user data messages whose content it can actually make useable (e.g. in the form of displays on a display of the subscriber device in the case of a transmitted color image, or playback in the case of an acoustic audio file), the following principle is proposed in accordance with an embodiment of the present invention. Taking as a starting point the method as illustrated above for Discontinuous Reception of messages (DRX), an information or description information should be transmitted in the first and/or the second planning message, but preferably in the second planning message, indicating in which form or type the possibly coded user data is present in the user data messages which are to be transmitted and, therefore, which capabilities a subscriber device must have in order to decode such data or make it usable for the user of the subscriber device (playback, display, etc.).

[0045] An advantage of the additionally transmitted description information is that a subscriber device limits the received user data messages not only to those messages which it has not yet received and whose content is of interest to the user of the subscriber device, but also to those messages which it is able to process and make usable for the user as a result of its device attributes or capabilities. A method for Discontinuous Reception (DRX) is therefore extended in such a way that a terminal also saves reception energy by not receiving user data messages which it cannot decode or, for example, cannot display or playback. As such, on the basis of a description information in a (first and/or second) planning message, if a subscriber device detects that it cannot process the user data which is contained in a user data message, the corresponding user data messages are not read or monitored from the announced transmission channel, thereby resulting in a reduction in the signal processing effort and in the energy requirements.

[0046] With reference to Figure 6, the following explains a preferred embodiment of the present invention of a method for Discontinuous Reception (DRX) within the framework of, or as an extension to, to the Cell Broadcast Service which has been specified in relation to UMTS. Since the first stage of the Discontinuous Reception (DRX) is not changed in this case, only the second stage relating to the second planning message is described below.

[0047] Corresponding with the second planning message or BMC planning message which is illustrated in Figure 5, the message being as specified in UMTS, the second planning message as illustrated in Figure 6 also contains inter alia the following information for each CBS message or user data message which is sent in the subsequent DRX period on the transmission channel that is used for CBS:

[0048] - message is new or old ("BitMap");

[0049] - message should / must / need not be read ("MD-Type"); and

[0050] - message identification which specifies the content of the message, such as weather information ("M-ID").

[0051] The BMC planning message is now extended further to include a set of information elements (also designated as MCD: "Message Contents Description") for each CBS message or MBS message (user data message) in the subsequent DRX period, wherein the set of information elements contains the following information. As shown in Figure 6, in accordance with the advantageous configuration which is illustrated there, a relevant information field "M-Des(1, etc.)" was extended in this case to include an information field "MCD" which has the following information element:

[0052] - type of data or data type, such as audio, video, text or image data (provided in the information element "Contents-Type" or abbreviated as "C-Type" in Figure 6);

[0053] - any parameters relating to the uncoded data, such as for images: dimensions in pixels horizontal / vertical (provided in the information element "C-Raw" in Figure 6);

[0054] - type of coding, such as for audio: none, MP3, AMR, WAV (provided in the information element "C-Cod" in Figure 6);

[0055] - any parameters relating to the coding (if required, depending on the coding) (provided in the information element "C-Param" in Figure 6).

[0056] It is noted that, instead of being assigned to the new information field "MCD," the information elements "C-Type," "C-Raw," "C-Cod," and "C-Param" also may be assigned to another information field such as the information field "MD-Type" for the purpose of extending its information.

[0057] In the method of the second stage of the Discontinuous Reception, a BMC planning message of the type which is illustrated in Figure 6 is now transmitted to the subscriber devices via a suitable transmission channel as per the prior art. The subscriber devices which are able to receive CBS messages receive the BMC planning message, evaluate it, and initially decide in the conventional way which messages or contents or topics (e.g., weather news) are possible for reception.

[0058] From these messages, in accordance with a preferred embodiment of the present invention, are then filtered out those which a subscriber device is not able to analyze, decode or make usable for the user as a result of its nature or capabilities (e.g., display size, decoding software, memory possibilities).

[0059] It is therefore possible that a user of a subscriber device firstly chooses which message contents the user would like to receive, and then possibly selects which data type of user data is permitted or which coding is permitted for reception (e.g., uncoded text data only, in order to consume a minimum of energy and time for processing). The subscriber device may then allow for the wishes of the user and only receive or select those user data messages for which it is designed (i.e., for which it has been configured by the user and, moreover possibly those which it is actually able to process. A message transmission which is both efficient and optimized in terms of energy consumption is therefore guaranteed.

[0060] Finally, the following example is given for the preferred embodiment of the present invention which is explained above. It is assumed that a subscriber device (such as a mobile phone) has an integrated MP3 player (e.g., as special software) and a display with a resolution of 50x50 pixels, but no video player (e.g., as special software). The subscriber device has been configured by the user in such a way that it will receive CBS or MBS messages which contain audio sequences, text and images, but not those containing the video sequences.

[0061] It is also assumed in this example that the user has effected settings for messages having an exemplary message ID of 4096.

[0062] It is now assumed that a CBS planning period includes three CBS or MBS messages having the message ID 4096, the messages being new and being

received or read from a conventional subscriber device. The data in the messages is of the following type:

[0063] - Message 1: type – audio ("C-Type"), length = 10 seconds ("C-Raw"), coding = MP3 ("C-Cod");

[0064] - Message 2: type – video ("C-Type"), resolution = 50 x 50 and length = 10 seconds ("C-Raw"), coding = MPEG4 ("C-Cod");

[0065] - Message 3: type – image ("C-Type"), resolution = 150 x 100 ("C-Raw"), coding = JPEC ("C-Cod").

[0066] In accordance with an embodiment of the present invention, a subscriber device decides, on the basis of its capabilities, that Message 1 will be received so that it can be played if the user wishes to do so. It is also decided not to receive Message 2 since video data cannot be displayed. Message 3 is only received if the terminal offers a possibility for scrolling larger images on the smaller display or for showing the image in a reduced size.

[0067] It is noted that the principles as described above (in relation to the introduction of a planning information which specifies the form, that is data type and/or coding, of the user data messages which must be transmitted) of the method for the Discontinuous Reception (DRX) of user data messages in relation to a Cell Broadcast Service also may be applied to a method for the Discontinuous Reception (DRX) of user data messages in relation to multicast (MC) or a multicast service; in particular, in the UMTS.

[0068] Such a method including use of a Discontinuous Reception (DRX) for multicast services is subsequently designated as MC DRX, wherein Discontinuous Reception (DRX) is as described above.

[0069] In a manner which is comparable to the CBS, corresponding messages announce the planning for MC DRX, which resources are available for MC services, and when these resources transport multicast messages. For this purpose, the messages for the planning and assignment of the resources contain inter alia information about the multicast groups. In an embodiment, the multicast groups are indexed via an MC address or an MC group identity.

[0070] So-called "Scheduling Messages" or planning messages, in turn, announce the planning for MC DRX, on which transmission channels, that is physical channels or transport channels, when frames or resources are available for MC services, and when these resources transport multicast messages. The various UMTS protocol layers are configured by the radio resource controller RRC on the basis of these planning messages. Therefore, the physical level is already aware of the resources in which an MC message or further planning messages can be expected at all. Moreover, by analyzing further information, the BMC layer can decide which MC messages actually should be received. Like the CBS, the planning is implemented in two stages as described below.

[0071] The first stage of the planning, MC DRX Level 1, signals which physical channels and transport channels are used for the transmission of planning information when preparing the transmission of an MC message. Unlike the CBS, the CTCH for MC services optionally is also mapped onto transport channels other than the FACH and onto physical channels other than the S_CCPCH. Moreover, the MC DRX Level 1 message or first planning message also contains information elements indicating which frames of the physical channels are reserved or assigned for the transmission of further planning information.

[0072] Such signaling is transmitted to the RRC via the logical channel BCCH as part of the system information. Within the MC DRX Level 1 message, it is therefore stated where, how many, and particularly when resources are assigned for the transmission of multicast (MC messages (user data messages). MC messages then may be transmitted in these frames only.

[0073] An index table corresponding to that in Figures 3 and 4 again may be used for MC DRX, allocating indices to the sets of resources in combination with the used physical channels and transport channels. Consequently, the assignment of resources in the subsequent second stage of the planning is made very easy by these indices.

[0074] For the second stage of the planning, MC DRX Level 2, a so-called "Inband Scheduling Message" or second planning message together with the actual MC message is again transmitted and analyzed by the BMC. Various information

corresponding to Figures 5 and 6 in relation to the CBS is transferred to the subscriber terminals (UE11, UE21, etc.) in this MC DRX Level 2 message.

[0075] In case the existing DRX for CBS is extended by the functionality for supporting MC DRX, an information element is introduced into the second planning message and is used to distinguish whether the reserved resources are resources for broadcast or multicast services. The information field "Message Type" or "M-Type" can be used, for example, to distinguish between a CBS message, MC message, planning message, etc.

[0076] In order to implement a method for user data transmission in the MC DRX according to an embodiment of the present invention, it is important to introduce an information element relating to the form of the user data message into one of the two planning messages and particularly into the second planning message; e.g., in the manner which has been described with reference to Figure 6 using the information elements "C-type," "C-Raw," "C-Cod" and "C-Param."

[0077] A summary of background information, inter alia about the protocols used in the present application, can be found in the following sources:

[0078] [1] 3GPP TS 25.324 V3.4.0, Broadcast/Multicast Control BMC, Release 1999.

[0079] [2] 3GPP 25.211, Physical Channels and mapping or transport channels onto physical channels, Release 99.

[0080] Although the present invention has been described with reference to specific embodiments, those of skill in the art will recognize that changes may be made thereto without departing from the spirit and scope of the present invention as set forth in the hereafter appended claims.

ABSTRACT OF THE DISCLOSURE

A method is provided for transmitting user data messages from a network element of a radio communication system via at least one transmission channel to at least one subscriber terminal of the radio communication system, whereby the form of the user data messages is announced before the transmission thereof via planning information. The planning information includes a first planning message by which the transmission of the user data messages is announced via a first separate transmission channel, and a second planning message by which description information is transmitted via at least one second transmission channel, the description information indicating the form of the user data messages to be transmitted. The form of the user data messages to be transmitted can include the data type and/or the codification of the user data messages. Announcing the form of the user data messages in the planning information enables the subscriber terminal to only intercept or receive the user data messages that it can actually process, thus enabling energy to be saved during reception and processing.

REMARKS

The present amendment makes editorial changes and corrects typographical errors in the specification, which includes the Abstract, in order to conform the specification to the requirements of United States Patent Practice. No new matter is added thereby. Attached hereto is a Substitute Specification including a marked-up version of the changes made thereto via by the present amendment.

In addition, the present amendment cancels original claims 1-13 in favor of new claims 14-29. Claims 14-29 have been presented solely because the revisions by red-lining and underlining which would have been necessary in claims 1-13 in order to present those claims in accordance with preferred United States Patent Practice would have been too extensive, and thus would have been too burdensome. The present amendment is intended for clarification purposes only and not for substantial reasons related to patentability pursuant to 35 U.S.C. §§101, 102, 103 or 112. Indeed, the cancellation of claims 1-13 does not constitute an intent on the part of the Applicants to surrender any of the subject matter of claims 1-13.

Early consideration on the merits is respectfully requested.

Respectfully submitted,

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Marked-Up Version of Substitute Specification

SPECIFICATION

~~Description~~TITLE OF THE INVENTION

METHOD, SUBSCRIBER DEVICE AND RADIO COMMUNICATION SYSTEM FOR TRANSMITTING USER DATA MESSAGES

BACKGROUND OF THE INVENTION

The present invention relates to a method for transmitting user data messages, from a sender to one or more recipients, a subscriber device and a radio communication system.

In the case of many services and applications which are offered in modern mobile radio systems, messages must be transmitted to not just one subscriber, but to two or more subscribers. Such services and applications include, for example, news groups, video conferences, video on demand, distributed applications, etc.

When transmitting the messages to the different subscribers, it is possible to send a copy of the data to each recipient separately. Although this technique is easy to implement, it is unsuitable for large groups. Because the same message is transmitted over N individual connections or unicast connections (N corresponds to the number of recipients) and is therefore sent multiple times over shared connection paths, this method ~~requires~~ requiring a very high bandwidth.

A more advantageous possibility is offered by multicast (group call) transmission. Here, the different subscribers to whom the same message is to be transmitted are combined into a multicast ~~group~~ group, and ~~said~~ the multicast group is assigned an address which is specifically known as a multicast address. The data which must be transmitted is only sent once to this multicast address accordingly. In an ideal case, the multicast message is sent only once over shared connection paths from the sender to the recipients. It is not necessary for the sender to know where and how many recipients are hiding behind the multicast address.

In the case of broadcast (collective call), messages are sent to all subscribers within a geographical area. Such an area can be specified as a part of the overall network, for example. As in the case of multicast, the broadcast message is ideally sent only once over shared connection paths from the sender to the recipients. Each

subscriber must implement enabling settings at the local terminal if ~~said~~ the subscriber wishes subsequently to analyze broadcast packets from a corresponding broadcast group. In this way, individual subscribers can specify whether they wish to receive or discard all broadcast messages, or whether they wish to receive specific messages only.

As part of a known method for data communication, a specific quantity of frames is ~~normally~~ typically always exchanged between a network and a mobile radio device within a specific time. In this case, a frame is a time-relative structure, upon which in a UMTS (Universal Mobile Telecommunications System), for example, the entire signal processing and data transmission is based, see [2].

If all these frames are continuously transmitted and received by the mobile radio device, this is known as continuous transmission or continuous reception. However, it is also possible during the transmission to use an interrupted (discontinuous) reception, namely Discontinuous Reception DRX, in order to reduce the energy requirements of the mobile radio devices, for example. When using DRX, the frames are not continuously transmitted and received by the mobile radio devices, but specific frames are omitted. In this mode, however, at least a specific subset of all frames or a subset of the possible frames must be transmitted in order to maintain the connection.

In the context of transmitting messages or data to various subscribers, it is now also conceivable to provide for a transmission of messages having multimedia content. A problem ~~can~~ may arise here, however, in that not all data types of transmitted multimedia messages can be processed by every subscriber device. In this case, it is then possible for a subscriber device to use resources and energy for receiving specific multimedia messages containing audio and video data, and for it then to transpire when processing the messages that the subscriber device is not designed to process or playback video data at all. In such a case, energy is wasted for no purpose and the service life of the subscriber device is reduced.

The ~~object of the~~ present invention is therefore ~~to create a possibility which provides~~ directed toward a way of providing an efficient, resource-saving, energy-

saving transmission of data or messages to one or more recipients of a point-to-multipoint service.

~~This problem is solved by a method according to Claim 1, a subscriber device according to Claim 12, and a radio communication system in accordance with Claim 13. Advantageous configurations are the subject matter of the subclaims.~~

SUMMARY OF THE INVENTION

According to a method for transmitting user data messages from a network element of a radio communication system over at least one transmission channel to one or more subscriber devices of the radio communication system, the form of the user data messages is announced ~~by means of a~~via planning information before their transmission. In particular, the form in relation to the processing of the user data messages by the subscriber device or subscriber devices is announced in this context. ~~The~~ An advantage of such a method is that the subscriber device or devices know from the announcement of the form of the user data messages, even before the user data messages are actually transmitted or ~~actually~~ received, whether ~~said~~ such subscriber device or devices are capable of processing the user data messages in such a way that they are useful to the user of the subscriber device (displaying a picture which is contained in the user data messages, playing an audio file, etc.). ~~This means that~~As such, on the basis of the planning information, the subscriber device or ~~the plurality of subscriber~~ devices can decide to receive only those user data messages which they are also capable of processing, thereby making it possible to save both resources and energy on the subscriber devices.

According to an ~~advantageous configuration~~embodiment, the method is implemented as a two-stage method, wherein the planning information is transmitted to the subscriber device or ~~the plurality of subscriber~~ devices ~~by means of~~via two separate planning messages. The transmission of the user data messages is announced ~~by means of~~by a first planning message via a first separate transmission channel. More precisely, the first planning message ~~can~~ may contain information about when or on which second separate transmission channel, of which there is at least one, second planning messages or user data messages will be

transmitted. ~~A description~~Description information, which specifies the form of the user data messages which are to be transmitted, is then transmitted via the announced second separate transmission channel, of which there is at least one, by ~~means of~~ the second planning message.

According to a further ~~advantageous configuration~~embodiment, the form of the user data messages which are to be transmitted ~~can~~ may include the data type ~~and additionally~~as well as the coding of the user data messages. In this case, the data type can be a text, image, audio or video format, etc. The coding ~~can~~ may include an MP3 (Moving Pictures Experts Group Layer-3 Audio) format, AMR (Adaptive Multi-Rate) format, WAV (Windows Wave) format, JPEG (Joint Photographic Experts Group) format or an MPEG4 (Motion Picture Experts Group 4) format. It is ~~moreover conceivable that~~also possible for the description information relating to the uncoded or coded user data messages ~~also includes~~to further include parameters which refer to, for example, the data volume, the image dimensions in the case of image and/or video data, or the playback duration in the case of audio and/or video data.

According to a further advantageous configuration, the method for transmitting user data, particularly in the two-stage configuration, can be carried out in the framework of a broadcast service, in particular as an extension of a Cell Broadcast Service ~~(CBS),~~(CMS) or a multicast service. In this context, ~~it is conceivable to use~~ the method is used as an extension of a Cell Broadcast Service, as specified in UMTS, which would require the radio communication system to be operated in accordance with the UMTS standard.

As mentioned above, the subscriber device or subscriber devices can analyze the planning information, ~~in particular~~particularly the second planning message or the description information which is contained therein relating to the user data messages that have to be transmitted, and ~~can~~ therefore may receive or monitor from the second transmission channel, of which there is at least one, only those user data messages which it ~~is~~ is, or they ~~are~~ are, designed to process. In this way, the processing effort ~~and~~ and, ~~therefore~~ therefore, the energy consumption in a subscriber device is restricted.

According to ~~an advantageous configuration~~another embodiment, a mobile radio device, in particular a mobile phone, is used as a subscriber device.

According to a further ~~aspect~~ embodiment of the present invention, a subscriber device is produced for a radio communication system, ~~said~~ with the subscriber device being designed in such a way that it can be operated in accordance with one of the methods ~~which is~~ described above.

According to ~~a further aspect~~yet another embodiment of the present invention, a radio communication system is produced for carrying out one of the methods ~~which is~~ described above.

~~Preferred embodiments of the present invention are described in greater detail below with reference to the attached drawings in which:~~

Additional features and advantages of the present invention are described in, and will be apparent from, the following Detailed Description of the Invention and the Figures.

BRIEF DESCRIPTION OF THE FIGURES

Figure 1 shows a schematic illustration of components of a radio communication system for notifying a group of one or more subscriber ~~devices;~~device.

Figure 2 shows a schematic illustration of a layered model of the protocols on the radio interface between a subscriber device and the responsible base station in the radio cell of ~~this~~ the subscriber device in the radio communication system according to Figure 1, ~~in particular~~particularly according to the UMTS ~~standard;~~standard.

Figure 3 shows an assignment of frames to a logical channel CTCH, via which the transmission of Cell Broadcast Messages takes ~~place;~~place.

Figure 4 shows an index table, as used for a Cell Broadcast Service (CBS) in Discontinuous Reception (DRX) mode, for the purpose of allocating an index to the quantities or sets of resources or ~~frames;~~frames.

Figure 5 shows a schematic illustration of the components of a conventional BMC planning message or second planning ~~message;~~message.

Figure 6 shows a schematic illustration of the components of a BMC planning message or second planning message, which is extended in accordance with a preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Figure 1 shows an exemplary schematic illustration of two radio cells CE1, CE2 of a radio communication system FCS which is ~~operated~~ operated, in ~~particular~~ particular, according to the UMTS (Universal Mobile Telecommunications System) standard. In terms of radio functionality, the radio cell CE1 is covered by the base station BS1 in this case, while the second radio cell CE2 is supplied by the base station BS2. These two base stations BS1, BS2 are representative of a multiplicity of further base stations of the radio communication system FCS, which further base stations are not illustrated in Figure 1 but include and cover the corresponding radio cells. The relevant base station is preferably formed by at least one radio transmitter and at least one radio receiver. It preferably has at least one transmitter antenna. In addition to or independently of its function of providing a radio connection to subscriber devices of the radio communication system FCS, the relevant base station can be responsible for the transmission in each case of data/messages to a fixed message/data network that may be present.

Within the radio communication system FCS, message/data signals are transmitted via at least one predefined radio interface between at least one subscriber device, ~~in particular~~particularly a mobile radio device ~~e.g.~~(e.g., a mobile ~~phone,~~phone) and at least one base station, preferably in accordance with a Time Division Multiple Access transmission method. It is preferably developed as a mobile radio system according to the UMTS standard. In particular, it is operated in so-called FDD mode (FDD: Frequency Division Duplex). In FDD mode, a separate signal transmission is achieved in up-link and down-link directions (up-link = signal transmission from the mobile radio device to the relevant base station; down-link = signal transmission from the relevant assigned base station to the mobile radio device) by a corresponding separate assignment of frequencies or frequency ranges. A ~~plurality~~ number of subscribers in the same radio cell are preferably

separated by orthogonal codes, ~~in particular~~particularly in accordance with the so-called CDMA method (CDMA: Code Division Multiple Access).

Subscriber devices preferably take the form of mobile radio ~~devices, e.g.~~ device; e.g., mobile radio telephones and ~~particularly~~ in particular, mobile phones. However, components of the radio communication network ~~can~~ also may include subscriber devices in the form of other message and/or data transmission devices ~~e.g.~~(e.g., internet-compatible terminals, computers, televisions, notebooks, fax devices, ~~etc.~~etc.) having an assigned radio unit for communication traffic ~~"on air",~~ "on air," ~~i.e.~~i.e., at least one radio interface. The subscriber devices are often mobile or portable in this ~~case, i.e.~~case (i.e., are used at different locations in the radio ~~network,~~network), but ~~can~~ also may be permanently configured at a location if required.

In Figure 1, the two base stations BS1, BS2 are controlled or monitored by a supervisory radio network controller RNC1 via associated data lines L1, L2. ~~Said~~ Such controller monitors the assignment of radio resources in the radio cells CE1, CE2 of the base stations BS1, BS2. In the present exemplary embodiment, a multiplicity of subscriber devices UE11 to UE51 are located in the radio cell CE1 of the base station BS1. Likewise, a ~~plurality~~ number of subscriber devices UE12 to UE42 are currently present in the second radio cell CE2 of the base station BS2. The subscriber devices UE11, UE21, UE31 in the first radio cell CE1 and the subscriber device UE42 in the second radio cell CE2 are assigned in advance to a predefinable group MC1, for which the receipt of one or more group messages must be enabled in the most efficient way possible.

Within the framework of the present invention, the term "group of subscriber devices" is preferably understood to ~~mean~~ refer to a classification according to technical ~~service,~~service; ~~i.e. in particular~~i.e., particularly a division according to those subscriber devices which allow a multicast transmission or a broadcast transmission, for example. Furthermore, the subscriber devices in the radio cells of the radio communication network ~~can~~ also may be sorted or divided according to a multiplicity of other criteria, particularly group message type,

~~e.g.~~such as sport messages, weather forecasts, etc., or reason for occurrence, for example.

In the case of many services and applications which are offered in modern mobile radio systems, it is particularly desirable to transmit messages to not just one but to two or more mobile radio subscribers. Examples of such services and applications are news groups, video conferences, video-on-demand, distributed applications, etc.

The protocol stack or layered model of the protocols on the radio interface in UMTS is illustrated in Figure 2, by way of example, for the subscriber device UE11 in the radio cell CE1 of the base station BS1. The mobile radio station UE11 has a physical layer PL1, which is responsible on the sending side for processing the data for transmission via the radio interface via physical channels PCS, and on the receiving side forwards the received data to the Medium Access Control layer MAC1 (MAC = Medium Access Control), which exists above it, in such a way that it can be further processed by ~~this~~ such layer. On the network side, the physical layer PL2 is situated in the base station BS1 which is connected to the radio network controller RNC1 via a fixed network connection. The connections between the physical layer and the MAC layer are called transport channels and specify how the data is transmitted ~~(e.g.~~(e.g., on general channels which are heard by every mobile radio device in the radio cell of the base station, or on channels which are specifically dedicated to only one specific mobile radio station). The MAC layer has tasks such as, for example, identifying the users for whom a data packet which has to be transmitted is destined if it is transmitted on general channels, and mapping logical transmission channels (LCS) to the transport channels (TCS). For this purpose, the MAC layer on the sending side adds control information such as the identity of the relevant mobile radio station, for example, to the data packets which must be transmitted, which it received from another higher layer RLC (RLC = Radio Link Control). This RLC layer is designated as RLC1 in the mobile radio station ~~UE11. This RLC layer~~UE11, and has the reference sign RLC2 in the base station BS1. In this case, the connections between the relevant MAC ~~layer, e.g.~~layer (e.g., MAC1 in the subscriber device UE11 and MAC2 in the radio network

controller ~~RNC1,~~RNC1) and the relevant associated Radio Link Control layer RLC1 or RLC2 are designated as logical channels. In order to map the logical transmission channels onto the transport channels, the relevant MAC layer on the sending side adds control information such as the identity of the relevant mobile radio station, for example, to the data packets which must be transmitted and which it received from the relevant higher RLC layer. On the receiving side, ~~this~~ such control information is analyzed and removed from the data packets again, and ~~said~~ the data packets are then forwarded to the RLC layer via the logical connections.

The relevant RLC layer RLC1 or RLC2 is ~~responsible~~ responsible, in each ~~case~~ case, for monitoring the data ~~transmission,~~transmission; ~~i.e.~~i.e., for detecting missing data packets and requesting these again if necessary. A ~~plurality~~ number of units can be defined in the RLC layer. In this case, each RLC unit has at least one connection between higher layers and RLC layer (~~e.g.~~e.g., Radio Bearer RB). The RLC layer on the sending side is also able to add control information to the packets which it receives from higher layers. This control information is used on the receiving side to assess whether packets are missing, for example. ~~It~~ The control information is removed from the packets before ~~these~~ they are forwarded again to the higher layers. Above the RLC layer is the Radio Resource Control layer RRC. In detail, this is designated as RRC1 in the subscriber device UE11 and as RRC2 in the assigned radio network controller RNC1. The relevant RRC layer is responsible for the configuration of the layers below it and, above all, for the connection setup. The connections between the relevant RLC layer and the RRC layer are called SRBs (Signaling Radio Bearers) and are designated as RRC1 for the subscriber device UE11 and as SRB2 for the radio network controller RNC1.

The so-called RBs (Radio Bearers) are also situated above the relevant RLC layer, and are used for the actual data ~~transmission~~ transmission, and represent the connection between the RLC layer and the application above it. If packet data is transmitted, the so-called Packet Data Convergence layer (PDCP = Packet Data Convergence Protocol) also exists above the relevant RLC ~~layer, e.g.~~layer (e.g., PDCP1 for the subscriber device UE11 and PDCP2 for the radio network controller RNC1 in this ~~case,~~case) and is ~~responsible~~ responsible, for ~~e.g.~~example for the

compression of IP (Internet Protocol) packets. Also situated above the RLC layer of the subscriber device UE11 and the radio network controller RNC1 of the base station BS1 in each case is the so-called Broadband Multicast Control layer BMC1 or ~~BMC2~~ BMC2, respectively (BMC = Broadband Multicast Controller), which is used for receiving any Cell Broadcast messages (CBS messages). As for the RLC layer, a ~~plurality~~ number of BMC units can be defined in the BMC layer concerned.

In ~~summary~~ summary, therefore, it can be stated that the transmission via the radio interface is implemented via so-called physical channels. The transmission services of the bit transmission layer or ~~of~~ the physical layer are performed via the transport channels at the service access points. Transport channels are characterized by the way in which the data is transmitted. The transmission services of the control layer or MAC layer are performed via the logical channels. Logical channels are characterized by the type of data that is transmitted. In this case, a distinction is made between control data and traffic data or user data.

Reference is made below to different logical channels and transport channels, ~~and these should therefore be~~ which are explained briefly ~~here:~~ here.

CBS messages are transmitted between RLC and MAC via a logical channel having the designation Common Traffic Channel CTCH. The CTCH is used for transmitting data of the user level to all subscriber terminals UEs (in particular UE11) or to a group of UEs. The CTCH is a unidirectional point-to-multipoint channel in the down-link section, ~~said~~ the channel being mapped onto a transport channel or Forward Access Channel FACH. The FACH is a shared transport channel on the down-link section, ~~said~~ the channel being used for transmitting relatively small quantities of data. The FACH is mapped onto a physical channel or radio channel accordingly, ~~said~~ the channel having the designation Secondary Common Control Physical Channel (S-CCPCH). The S-CCPCH essentially carries information of the FACH and of one or more Paging Channels PCH. A physical channel or radio channel Primary Common Control Physical Channel (P-CCPCH) transmits the information of the BCH.

The logical channel Broadcast Control Channel BCCH is a shared channel of the down-link section, with control data being broadcast on ~~said~~ the channel to all UEs in a radio cell. This control data ~~comprises~~includes, for example, the System Information Blocks (SIB). The BCCH is either mapped onto the FACH or onto the Broadcast Channel BCH.

A transmission of data with interrupted or so-called Discontinuous Reception DRX has already been described at the beginning as a known measure ~~for e.g.~~for, for example, reducing the energy requirements of the mobile radio device. DRX is used inter alia for the Cell Broadcast Service CBS which is specified in the UMTS. The system-internal planning for this, if frames or resources are available for CBS services and if these resources transport CBS messages, is made public by so-called scheduling information or planning messages. This planning is implemented in two ~~stages:~~stages.

The first stage of the planning (CB DRX Level 1) is to signal (within the first planning message or CB DRX Level 1 message) which transmission channel or which FACH (as at least one second separate transmission channel) is used and when messages are transmitted on ~~this~~ such ~~channel,~~channel; ~~i.e.~~i.e., which resources of the FACH or which frames of the S-CCPCH are actually reserved or assigned for the transmission of "Cell Broadcast" messages. This signaling should be transmitted to the RRC (RRC1) as part of the system information or system information messages via the cell-specific and logical channel BCCH (as first separate transmission channel). More precisely, information elements (IE) relating to this are defined and sent within the system information messages on the BCCH. The first planning message includes a notification of how many ~~frames~~ frames, and when ~~frames~~ frames, are assigned for the transmission of Cell Broadcast messages. CBS messages ~~can~~ then may be transmitted in these frames only.

The illustration in Figure 3 shows an example of the assignment of frames to the logical channel CTCH, via which the transmission of Cell Broadcast messages takes place. An offset of two frames to Frame Number 0, a periodicity of six frames for the allocated resources, and a quantity of two consecutive frames are assumed. Now a mobile terminal UE which wants to receive CBS messages no

longer has to check every frame, but only the content of the frames having the numbers 2/3, 8/9, 14/15, etc. The processing effort within the UE is consequently reduced, thereby also reducing the energy requirements within it.

For CBS DRX, provision is made for the use of an index table in which an index is allocated to the sets of resources or frames, as shown by the illustration in Figure 4. It is then very easy to coordinate the assignment of the resources in the subsequent second stage of the planning or the second planning message via ~~this~~ such index.

For the second stage of the planning (CBS DRX Level 2), a so-called "Inband Scheduling" message (inband planning message) or second planning message is transmitted together with the actual Cell Broadcast message on the logical channel CTCH and analyzed by the BMC (BMC1). Various information is communicated to the UEs (UE11) in this second planning message or CBS DRX Level 2 message, ~~indicating e.g.~~indicating, for example, which of the CBS messages, ~~i.e.~~i.e., that is the actual user data messages, include which topics or contents (e.g. weather information) and whether these messages or the information contained therein have changed since the last transmission. In this way, the terminal (UE11) ~~then~~ only receives CBS messages if either useful information which was not previously received is transmitted or DRX Level 2 information is transmitted once again. The Broadcast/Multicast Control (BMC, in Figure 2: BMC1 and BMC2) protocol [1] of the UMTS protocol stack is responsible for implementing the second DRX stage or the second planning message, ~~and therefore~~wherein the messages which are sent by ~~this~~ the protocol ~~can~~ also may be designated as "BMC" planning messages (BMC schedule messages).

In the second stage of the planning, the transmission time is divided into so-called time periods or DRX periods, and information about the CBS messages (user data messages) which are sent in the period is communicated [1] by the BMC planning messages or second planning messages at least once for each period. An example of a BMC planning message is illustrated in Figure 5. In addition to the "M-Type" information element for characterizing the message (i.e. indicating that it is a planning message and not a user data message, for example) and an "Off"

information element relating to an offset for the first frame which is used for the transmission of CBS messages in the DRX period, this BMC planning message contains a "Len" information element relating to the length of the DRX period. The BMC planning message also includes a bitmap field "BitMap" which is shown here as an exemplary field having 7 bits and indicates by the setting of a bit, for each CBS message which is transmitted in the following DRX period, whether the message is new or was already transmitted. The BMC planning message also contains a list of message descriptions ~~"M-Des",~~ "M-Des," of which one in ~~said~~ the list is present for each CBS message (user data message) in the following DRX period and features a message description type "MD-Type" which ~~indicates e.g.~~ indicates, for example, whether the message is a repetition within the same DRX period or a new message and, depending on the MD-Type, a message identification "M-ID" for new messages, which specifies the content of the message (~~e.g.~~ e.g., weather information), or a reference to the first send time-point of the message in the case of repeated messages. It should be noted that arrows in ~~the~~ Figures 5 and 6 indicate a detailed description of an information element of a message.

When transmitting CBS messages or user data messages in the CBS, ~~said~~ the CBS being specified in UMTS (see description above) or GSM (GSM: Global System for Mobile Communication), it is ~~now conceivable~~ additionally possible to provide for a transmission of messages having multimedia contents. Such a service can be designated generally as a "Multimedia Broadcast Service" (MBS). In order to prevent a specific subscriber device from attempting to receive or process user data messages whose content it can actually make useable (e.g. in the form of displays on a display of the subscriber device in the case of a transmitted color image, or playback in the case of an acoustic audio file), the following principle is proposed in accordance with an embodiment of the present invention. Taking as a starting point the method as illustrated above for Discontinuous Reception of messages (DRX), an information or description information should be transmitted in the first and/or the second planning message, but preferably in the second planning message, indicating in which form or type the possibly coded user data is

present in the user data messages which are to be ~~transmitted, and therefore~~transmitted and, therefore, which capabilities a subscriber device must have in order to decode ~~this~~ such data or make it usable for the user of the subscriber device (playback, display, etc.).

~~The~~ An advantage of ~~this~~ the additionally transmitted description information is that a subscriber device limits the received user data messages not only to those messages which it has not yet received and whose content is of interest to the user of the subscriber device, but also to those messages which it is able to process and make usable for the user as a result of its device attributes or capabilities. A method for Discontinuous Reception (DRX) is therefore extended in such a way that a terminal also saves reception energy by not receiving user data messages which it cannot decode or, for example, cannot display or playback. ~~This means that if~~As such, on the basis of a description information in a (first and/or second) planning message, if a subscriber device detects that it cannot process the user data which is contained in a user data message, the corresponding user data messages are not read or monitored from the announced transmission channel, thereby resulting in a reduction in the signal processing effort and ~~therefore a reduction~~ in the energy requirements.

With reference to Figure 6, the following explains a preferred embodiment of the present invention of a method for Discontinuous Reception (DRX) within the framework ~~of~~ of, or as an extension to, to the Cell Broadcast Service which has been specified in relation to UMTS. Since the first stage of the Discontinuous Reception (DRX) is not changed in this case, only the second stage relating to the second planning message is described below.

Corresponding with the second planning message or BMC planning message which is illustrated in Figure 5, ~~said~~ the message being as specified in UMTS, the second planning message as illustrated in Figure 6 also contains inter alia the following information for each CBS message or user data message which is sent in the subsequent DRX period on the transmission channel that is used for CBS:

- message is new or old ("BitMap");

- message should / must / need not be read ("MD-Type"); and
- message identification which specifies the content of the message, ~~e.g.~~ such as weather information ("M-ID").

~~This~~ The BMC planning message is now extended further to include a set of information elements (also designated as MCD: "Message Contents Description") for each CBS message or MBS message (user data message) in the subsequent DRX period, wherein ~~said~~ the set of information elements contains the following information. As shown in Figure 6, in accordance with the advantageous configuration which is illustrated there, a relevant information field "M-Des(1, etc.)" was extended in this case to include an information field "MCD" which has the following information element:

- type of data or data type, ~~e.g.~~ such as audio, video, text or image data (provided in the information element "Contents-Type" or abbreviated as "C-Type" in Figure 6);
- any parameters relating to the uncoded data, ~~e.g.~~ such as for images: dimensions in pixels horizontal / vertical (provided in the information element "C-Raw" in Figure 6);
- type of coding, such as ~~e.g.~~ for audio: none, MP3, AMR, WAV (provided in the information element "C-Cod" in Figure 6);
- any parameters relating to the coding (if required, depending on the coding) (provided in the information element "C-Param" in Figure 6).

It is noted that, instead of being assigned to the new information field ~~"MCD",~~ "MCD," the information elements ~~"C-Type", "C-Raw", "C-Cod", "C-Param"~~ "C-Type," "C-Raw," "C-Cod," and "C-Param" ~~can~~ also may be assigned to another information field such as the information field "MD-Type" for the purpose of extending its information.

In the method of the second stage of the Discontinuous Reception, a BMC planning message of the type which is illustrated in Figure 6 is now transmitted to the subscriber devices via a suitable transmission channel as per the prior art. The subscriber devices which are able to receive CBS messages receive the BMC

planning message, evaluate it, and initially decide in the conventional way which messages or contents or topics (~~e.g.~~e.g., weather news) are possible for reception.

From these messages, in accordance with ~~the~~ a preferred embodiment of the present invention, are then filtered out those which a subscriber device is not able to analyze, decode or make usable for the user as a result of its nature or capabilities (~~e.g.~~e.g., display size, decoding software, memory possibilities).

It is therefore possible that a user of a subscriber device firstly ~~choose~~ chooses which message contents ~~said~~ the user would like to receive, and ~~possibly~~ then possibly selects which data type of user data is permitted or which coding is permitted for reception (~~e.g.~~e.g., uncoded text data only, in order to consume a minimum of energy and time for processing). The subscriber device ~~can~~ may then allow for the wishes of the user and only receive or select those user data messages for which it is ~~designed, i.e.~~designed (i.e., for which it has been configured by the ~~user,~~user ~~and~~ and, ~~possibly~~ moreover possibly those which it is actually able to process. A message transmission which is both efficient and optimized in terms of energy consumption is therefore guaranteed.

Finally, the following example is given for the preferred embodiment of the present invention which is explained above. It is assumed that a subscriber device (such as a mobile phone) has an integrated MP3 player (~~e.g.~~e.g., as special software) and a display with a resolution of 50x50 pixels, but no video player (e.g., ~~e.g.~~ as special software). The subscriber device has been configured by the user in such a way that it will receive CBS or MBS messages which contain audio sequences, text and images, but not those containing the video sequences.

It is also assumed in this example that the user has effected settings for messages having an exemplary message ID of 4096.

It is now assumed that a CBS planning period includes three CBS or MBS messages having the message ID 4096, ~~said~~ the messages being new and being received or read from a conventional subscriber device. The data in the messages is of the following type:

- Message 1: type – audio ("C-Type"), length = 10 seconds ("C-Raw"), coding = MP3 ("C-Cod");

- Message 2: type – video ("C-Type"), resolution = 50 x 50 and length = 10 seconds ("C-Raw"), coding = MPEG4 ("C-Cod");
- Message 3: type – image ("C-Type"), resolution = 150 x 100 ("C-Raw"), coding = JPEC ("C-Cod").

In accordance with an embodiment of the present invention, a subscriber device decides, on the basis of its capabilities, that Message 1 will be received so that it can be played if the user wishes to do so. It is also decided not to receive Message 2 since video data cannot be displayed. Message 3 is only received if the terminal offers a possibility for scrolling larger images on the smaller display or for showing the image in a reduced size.

It is noted that the principles as described above (in relation to the introduction of a planning information which specifies the form, ~~i.e.~~that is data type and/or coding, of the user data messages which must be transmitted) of the method for the Discontinuous Reception (DRX) of user data messages in relation to a Cell Broadcast Service ~~can~~ also may be applied to a method for the Discontinuous Reception (DRX) of user data messages in relation to multicast (MC) or a multicast ~~service,~~service; in ~~particular~~ particular, in the UMTS.

Such a method including use of a Discontinuous Reception (DRX) for multicast services is subsequently designated as MC DRX, wherein Discontinuous Reception (DRX) is as described above.

In a manner which is comparable to the CBS, corresponding messages announce the planning for MC DRX, which resources are available for MC services, and when these resources transport multicast messages. For this purpose, the messages for the planning and assignment of the resources contain inter alia information about the multicast groups. In an embodiment, the multicast groups are indexed ~~by means of~~via an MC address or an MC group identity.

So-called "Scheduling Messages" or planning ~~messages~~ messages, in ~~turn~~ turn, announce the planning for MC DRX, on which transmission channels, ~~i.e.~~that is physical channels or transport channels, when frames or resources are available for MC services, and when these resources transport multicast messages. The various UMTS protocol layers are configured by the radio resource controller RRC

on the basis of these planning messages. ~~Therefore~~ Therefore, the physical level is already aware of the resources in which an MC message or further planning messages can be expected at all. Moreover, by analyzing further information, the BMC layer can decide which MC messages ~~should~~ actually should be received. Like the CBS, the planning is implemented in two stages as described ~~below:~~ below.

The first stage of the planning, MC DRX Level 1, signals which physical channels and transport channels are used for the transmission of planning information when preparing the transmission of an MC message. Unlike the CBS, the CTCH for MC services ~~is~~ optionally is also mapped onto transport channels other than the FACH and onto physical channels other than the S_CCPCH. Moreover, the MC DRX Level 1 message or first planning message also contains information elements indicating which frames of the physical channels are reserved or assigned for the transmission of further planning information.

~~This~~ Such signaling is transmitted to the RRC via the logical channel BCCH as part of the system information. Within the MC DRX Level 1 message, it is therefore stated where, how many, and particularly when resources are assigned for the transmission of multicast (MC messages (user data messages). MC messages ~~can~~ then may be transmitted in these frames only.

An index table corresponding to that in Figures 3 and 4 ~~can~~ again may be used for MC DRX, allocating indices to the sets of resources in combination with the used physical channels and transport channels. Consequently, the assignment of resources in the subsequent second stage of the planning is made very easy by these indices.

For the second stage of the planning, MC DRX Level 2, a so-called "Inband Scheduling Message" or second planning message together with the actual MC message is again transmitted and analyzed by the BMC. Various information corresponding to ~~the~~ Figures 5 and 6 in relation to the CBS is transferred to the subscriber terminals (UE11, UE21, etc.) in this MC DRX Level 2 message.

In case the existing DRX for CBS is extended by the functionality for supporting MC DRX, an information element is introduced into the second planning message and is used to distinguish whether the reserved resources are

resources for broadcast or multicast services. The information field "Message Type" or "M-Type" can be used, for example, to distinguish between a CBS message, MC message, planning message, etc.

In order to implement a method for user data transmission in the MC DRX according to an embodiment of the present invention, it is ~~however~~ important to introduce an information element relating to the form of the user data message into one of the two planning messages and particularly into the second planning ~~message, e.g.~~message; e.g., in the manner which has been described with reference to Figure 6 using the information elements ~~"C-Type", "C-Raw", C-Cod" and "C-Param".~~ "C-type," "C-Raw," "C-Cod" and "C-Param."

A summary of background information, inter alia about the protocols used in the present application, can be found ~~in particular~~ in the following sources:

[1] 3GPP TS 25.324 V3.4.0, Broadcast/Multicast Control BMC, Release ~~1999;~~1999.

[2] 3GPP 25.211, Physical Channels and mapping or transport channels onto physical channels, Release 99.

Although the present invention has been described with reference to specific embodiments, those of skill in the art will recognize that changes may be made thereto without departing from the spirit and scope of the present invention as set forth in the hereafter appended claims.

ABSTRACT OF THE DISCLOSURE

~~Abstract: The invention relates to a~~A method is provided for transmitting user data messages from a network element of a radio communication system via at least one transmission channel to at least one subscriber terminal of the radio communication system, whereby the form of the user data messages is announced before the transmission thereof ~~by means of~~via planning information ~~(BMC planning message; C-Type, C-Raw, C-Cod, C-Param)~~. ~~Said~~ The planning information ~~especially comprises~~includes a first planning message by which ~~means~~ the transmission of the user data messages is announced via a first separate transmission channel, and a second planning message ~~(BMC planning message)~~ by which ~~means~~ description information ~~(C-Type, C-Raw, C-Cod, C-Param)~~ is transmitted via at least one second transmission channel, ~~said~~ the description information indicating the form of the user data messages to be transmitted. The form of the user data messages to be transmitted can include the data type ~~(C-type)~~ and/or the codification ~~(C-Cod)~~ of the user data messages. Announcing the form of the user data messages in the planning information enables the subscriber terminal to only intercept or receive the user data messages that it can actually process, thus enabling energy to be saved during reception and processing.

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of claims:

Claims 1-13 (canceled)

Claim 14 (new): A method for transmitting user data messages from a network element of a radio communication system over at least one transmission channel to at least one subscriber device of the radio communication system, the method comprising announcing a form of the user data messages via planning information before transmission of the user data messages, wherein the form of the user data messages to be transmitted includes at least one of a data type and a coding of the user data messages.

Claim 15 (new): A method for transmitting a user data messages as claimed in Claim 14, wherein the planning information includes a first planning message by which the transmission of the user data messages is announced via a first separate transmission channel, and a second planning message by which description information specifying the form of the user data messages to be transmitted is transmitted via at least one second separate transmission channel.

Claim 16 (new): A method for transmitting user data messages as claimed in Claim 14, wherein the data type includes one of a text format, an image format, an audio format and a video format.

Claim 17 (new): A method for transmitting user data messages as claimed in Claim 14, wherein the coding includes one of an MP3 format, an AMR format, a WAV format, a JPEG format and an MPEG 4 format.

Claim 18 (new): A method for transmitting user data messages as claimed in Claim 15, wherein the description information further includes parameters referring to one of data volume, image dimensions for at least one of image data

and video data, and a playback duration for at least one of audio data and video data.

Claim 19 (new): A method for transmitting user data messages as claimed in Claim 14, wherein the method is carried out in a framework of a broadcast service.

Claim 20 (new): A method for transmitting user data messages as claimed in Claim 19, wherein the broadcast service is an extension of a Cell Broadcast Service.

Claim 21 (new): A method for transmitting user data messages as claimed in Claim 19, wherein the broadcast service is a multicast service.

Claim 22 (new): A method for transmitting user data messages as claimed in Claim 14, wherein the radio communication system is operated in accordance with a UMTS standard.

Claim 23 (new): A method for transmitting user data messages as claimed in Claim 15, wherein the first planning message contains information about when and on which second separate transmission channel, of which there is at least one, at least one of second planning messages and user data messages are transmitted.

Claim 24 (new): A method for transmitting user data messages as claimed in Claim 14, wherein the at least one subscriber device receives only the user data messages which the at least one subscriber device is designed to process.

Claim 25 (new): A method for transmitting user data messages as claimed in Claim 14, wherein the subscriber device is a mobile radio device.

Claim 26 (new): A method for transmitting user data messages as claimed in Claim 25, wherein the mobile radio device is a mobile phone.

Claim 27 (new): A method for transmitting user data messages as claimed in Claim 24, wherein the at least one subscriber device receives only the user data messages which, with regard to the announced form, it is able to process.

Claim 28 (new): A subscriber device of a radio communication system, in which user data messages are transmitted over at least one transmission channel to the subscriber device, comprising parts for receiving only the user data messages which, with regard to an announced form, it is able to process, wherein the form of the user data messages is announced by planning information before transmission of the user data messages, with the form of the user data messages to be transmitted including at least one of a data type and a coding of the user data messages.

Claim 29 (new): A radio communication system, comprising:

at least one subscriber device; and

a network element for transmitting user data messages over at least one transmission channel to the at least one subscriber device, wherein a form of the user data messages is announced by planning information before transmission of the user data messages, with the form of the user data messages to be transmitted including at least one of a data type and a coding of the user data messages.